Systems Approach to Urban Operations

A Monograph
by
Lieutenant Colonel David W. Sutherland
United States Army

EMENS EST CLAVIS VICTORIAE

School of Advanced Military Studies
United States Army Command and General Staff College
Fort Leavenworth, Kansas
AY 02-03

		Form Approved
Report Documentation Page		OMB No. 0704-0188

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

1. REPORT DATE **22 MAY 2003**	2. REPORT TYPE	3. DATES COVERED **-**

4. TITLE AND SUBTITLE **Systems approach to urban operations**	5a. CONTRACT NUMBER
	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S) **David Sutherland**	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **US Army School for Advanced Military Studies,250 Gibbons Ave,Fort Leavenworth,KS,66027**	8. PERFORMING ORGANIZATION REPORT NUMBER **ATZL-SWV**

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

Planning for combat in an urban environment is a complex task. The urban environment combines the challenge of conventional combat with the complexity of three-dimensional terrain, constrained maneuver space, and a high density of people on the battlefield. The traditional answer to this problem was to rubble the city while defeating the organized resistance found within the urban area. The battles of Aachen, Stalingrad, and Grozny (2000), reflect this rubble approach. However, several factors have driven military thinkers to look for a more efficient and effective manner to defeat an adversary within an urban environment. These factors include a lower tolerance for friendly military and civilian casualties, post-conflict considerations, and a smaller friendly force structure. This monograph describes a possible technique to allow military planners to identify key objectives that may be affected in gaining control of a city without destroying it. This technique involves viewing a city as a complex "system of systems" and offers the planner insights as to where to apply military means to achieve the desired ends. While much has been written on Effect Based Operations (EBO), this monograph attempts to "operationalize" the concept. It presents a planning technique to assist in identifying targets, understanding target interrelationships, and analyzing second and third order effects. This study uses the urban environment to present this planning technique. The primary research question is: Is it possible to seize and control a city without destroying it? The secondary question is: Is there a systems approach process to achieve military success in an urban environment? The purpose of this paper is to provide the operational commander with an approach to manage the complexity of the urban environment. It should provide the reader with a systems approach that is grounded in doctrine, a methodology to reduce complexity, and a practical planning approach to assist in urban operations. The systems approach discussed in this paper allows commanders to seize control of a city without destroying it. The approach can be seen as a graduated response matrix where critical requirements are affected in sequence in order to achieve a desired result. While it is impossible to determine to which threshold the adversary would relinquish his control of the city (aim), the systems approach does provide a method to gradually reach that threshold. In addition, the systems approach allows commanders to war-game and record the effects of an action throughout the entire greater system. This provides the commander with an analysis tool that captures potential second and third order effects that may or may not be desired. This is a technique that should be incorporated in the commander's decision support matrix.

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**	**1**	**67**	

Abstract

SYSTEMS APPROACH TO URBAN OPERATIONS by Lieutenant Colonel David W. Sutherland & Major John W. Reynolds, United States Army, 62 pages.

Planning for combat in an urban environment is a complex task. The urban environment combines the challenge of conventional combat with the complexity of three-dimensional terrain, constrained maneuver space, and a high density of people on the battlefield. The traditional answer to this problem was to rubble the city while defeating the organized resistance found within the urban area. The battles of Aachen, Stalingrad, and Grozny (2000), reflect this rubble approach. However, several factors have driven military thinkers to look for a more efficient and effective manner to defeat an adversary within an urban environment. These factors include a lower tolerance for friendly military and civilian casualties, post-conflict considerations, and a smaller friendly force structure.

This monograph describes a possible technique to allow military planners to identify key objectives that may be affected in gaining control of a city without destroying it. This technique involves viewing a city as a complex "system of systems" and offers the planner insights as to where to apply military means to achieve the desired ends. While much has been written on Effect Based Operations (EBO), this monograph attempts to "operationalize" the concept. It presents a planning technique to assist in identifying targets, understanding target interrelationships, and analyzing second and third order effects. This study uses the urban environment to present this planning technique.

The primary research question is: Is it possible to seize and control a city without destroying it? The secondary question is: Is there a systems approach process to achieve military success in an urban environment? The purpose of this paper is to provide the operational commander with an approach to manage the complexity of the urban environment. It should provide the reader with a systems approach that is grounded in doctrine, a methodology to reduce complexity, and a practical planning approach to assist in urban operations.

The systems approach discussed in this paper allows commanders to seize control of a city without destroying it. The approach can be seen as a graduated response matrix where critical requirements are affected in sequence in order to achieve a desired result. While it is impossible to determine to which threshold the adversary would relinquish his control of the city (aim), the systems approach does provide a method to gradually reach that threshold. In addition, the systems approach allows commanders to war-game and record the effects of an action throughout the entire greater system. This provides the commander with an analysis tool that captures potential second and third order effects that may or may not be desired. This is a technique that should be incorporated in the commander's decision support matrix.

TABLE OF CONTENTS

FIGURES

CHAPTER ONE

Introduction

> We are becoming so powerful at traditional modes of
> warfare that we will drive our enemies into environments
> where our efficiency plummets, our effectiveness drops,
> and close combat remains the order of the day.[1]

Ralph Peters,
Fighting For the Future

Planning for combat in an urban environment is a complex task. The urban environment combines the challenge of conventional combat with the complexity of three-dimensional terrain, constrained maneuver space, and a high density of people on the battlefield. The traditional answer to this problem was to rubble the city while defeating the organized resistance found within the urban area. The battles of Aachen, Stalingrad, and Grozny (2000), reflect this rubble approach. However, several factors have driven military thinkers to look for a more efficient and effective manner to defeat an adversary within an urban environment. These factors include a lower tolerance for friendly military and civilian casualties, post-conflict considerations, and a smaller friendly force structure.

Precision weapon systems and information dominance may facilitate a more efficient approach. This monograph's approach focuses on identifying objectives that will

---

[1] Ralph Peters, *Fighting For the Future*, (Mechanicsburg, PA: Stackpole Books, 1991), 90.

gain control of a city without destroying it - an effect based approach rather than a rubble approach.[2] This monograph describes a possible technique to allow military planners to identify key objectives that may be affected in gaining control of a city without destroying it. This technique involves viewing a city as a complex "system of systems" and offers the planner insights as to where to apply military means to achieve the desired ends. While much has been written on Effect Based Operations (EBO), this monograph attempts to "operationalize" the concept. It presents a planning technique to assist in identifying targets, understanding target interrelationships, and analyzing second and third order effects. This study uses the urban environment to present this planning technique.

This paper has four chapters to address the topic. Chapter two defines the environment in terms of history and doctrine in order to answer the research question. Chapter three is the combination of theory and doctrine to form the foundation of a systems approach process. Chapter four is the explanation of a technique that places theory and doctrine into practice. Chapter four was developed by a working group of five Advanced Military Studies Students and one Advanced Operational Arts Studies Fellow from the School of Advanced Military Studies during a planning operation. Finally,

---

[2] Planning for effects is complex and requires heavy intelligence resources, and precision systems that can direct effects at specific targets. Effects is defined as the ability of an actor to bring about a desired objective, or aim by affecting specific targets. Edward C. Mann III, Gary Endersby, and Thomas R. Searle, *Thinking Effects: Effects Based Methodology for Joint Operations*, *CADRE Paper No. 15*, (Maxwell Air Force Base: Air University Press, October 2002), 3.

Chapter five gives conclusions and recommendations to the systems approach to urban operations discussed in this paper.[3]

Specifically, Chapter one will address three areas: the problem statement, an urban operations background, and the limitations of this study.

Statement of the Problem

The primary research question is: Is it possible to seize and control a city without destroying it? The secondary question is: Is there a systems approach process to achieve military success in an urban environment? The purpose of this paper is to provide the operational commander with an approach to manage the complexity of the urban environment. It should provide the reader with a systems approach that is grounded in doctrine, a methodology to reduce complexity, and a practical planning approach to assist in urban operations.

Background

Urban operations are in the military's future. Within the last ten years America has experienced the difficulties of urban operations, specifically in Mogadishu, Bosnia, Kosovo, and Macedonia, not to mention the difficulties experienced by Russia in Grozny. Some of these operations were at one end of the conflict spectrum which included attack and defend during Mogadishu and Grozny. The United States (US) has also witnessed the commitment of forces at the other end of the spectrum, namely in stability and support operations during Bosnia, Kosovo, and Macedonia. This trend in conducting military

---

[3] This represents the ideas, efforts, and techniques developed during the recent planning mission of six officers assigned the task of solving the problem-how to seize a city without destroying it: LTC David Sutherland, MAJ Gerald Burton, MAJ Martha Granger, MAJ John Reynolds, MAJ David Tohn, and MAJ Meg Vanasse. Hence forth known as Working Groups' Idea.

operations in urban environments will continue due to an increase in world population

and due to the US conventional military dominance.

World Population

       As the world population increases and more and more people move to cities to

seek resources, people become lucrative targets for potential adversaries. Recent United

Nations (UN) forecasts stated that virtually all the population growth between 2000-2030

will be concentrated in urban areas. "At current rates of change, the number of urban

dwellers will equal the number of rural dwellers in the world [by] 2007."[4] As this trend

to urbanization increases, the military significance of cities is likely to increase. Robert

D. Kaplan, author of *The Coming Anarchy*, argued that this overcrowding in cities and

the eventual clash of race and culture could lead to a competition for resources and cause

criminal anarchy. For example, Kaplan cites the case of western aid workers being held

at mercy by a handful of local Italians in Mogadishu during the 1990s famine crisis. It

was only through an arrangement of bribes and payoffs that the aid workers could

accomplish their tasks in providing support to the population.[5] When relief operations in

Somalia proved to be inadequate, due to the obstruction by these extortionists, the UN

conducted a humanitarian relief operation in 1993. The US, a participant in the UN

humanitarian operation, quickly found itself involved militarily to confront the criminal

anarchy that had taken hold in the city.

---

[4] United Nations, *World Urbanization Prospects: The 2001Revision*, (New York: United Nations Population Division of the Department of Economic and Social Affairs, 2002), 1.

[5] Robert Kaplan, *The Coming Anarchy*, (New York: Random House, 2000), 7-13, 166.

US Military Dominance

While urbanization certainly increases the likelihood for US military involvement in cities, it does not remain the only reason. US military dominance in open terrain operations may also force our adversaries into urban areas to avoid open and frontal combat with the US.[6] An example of the US conventional dominance was the Gulf War in 1991.[7] The US currently faces no peer military competitor or rival military coalition. The Gulf War clearly showed the futility of attempting to match the US with conventional methods in open terrain combat. Therefore, America's enemies may be moving into cities and other complex terrain in order to degrade America's technological overmatch.

Overhead surveillance may not be able to penetrate the dense urban terrain nor differentiate between combatants and noncombatants. Therefore within urban settings combat systems will lose the advantage of stand off range and will be forced to operate in an environment where the adversary can achieve parity. Their intent may be to force a

---

[6] U.S. Army, FM 3-06, *Urban Operations*, (Washington, D.C.: Government Printing Office, 2002), 1-4.

[7] It was February 27, 1991, and the 1st Medina Republican Guard Division had completed its six-mile-long defensive position along a ridge line in Iraq; the Iraqi battalion commanders had completed digging their fighting positions for their T-72s and T-55s along Low Hill, and had coordinated artillery and mortar fires to assist in their upcoming fight. The Clausewitzen theory, as relating to the strength of the defense and the favorable location of terrain, was to provide the Iraqi commanders with the advantage needed to win the battle and bring about the crushing blow against the American advances.

Colonel Montgomery Meigs, commander of the 2nd Brigade, 1st Armored Division, crested the Low Hill ridge and halted. Scanning to the opposite side of the valley with his enhanced optical and thermal sights, he quickly spotted the entrenched brigade of the 1st Medina Republican Guard Division. Colonel Meigs ordered his tanks to advance to a point just 2500 yards from the enemy position, and gave them the order to open fire. The Iraqi tanks had no chance. Their antiquated targeting system did not allow them to spot the American tanks that were over a mile away, and even if they could spot the tanks, their rounds fell well short of their targets. Within forty-five minutes the American brigade destroyed sixty T-72 tanks, nine T-55 tanks, and thirty- eight Iraqi armored personnel carriers with no loss to friendly personnel and equipment. Colonel Miegs stated that, "It was more like a one-sided clay pigeon shoot than an armored battle." This Iraqi brigade, one of the best and well-trained brigades in the Iraqi Army, crumbled to American technology in less then forty-five minutes. Michael R. Gordon and General Bernard E.

fight on more favorable terms. In addition, the US military's conventional dominance

may drive our adversaries to more indirect and asymmetric approaches. As mentioned,

these threats may avoid open area contact and hide among the population. Attacks

against these threats then become difficult, if not impossible, due to causing and

identifying responsibility for the cause of collateral damage.

Siege Warfare and Rubble

Urbanization and the effects of US military dominance increases the chances that

the US military will conduct operations within an urban environment, and more

specifically within cities. Siege warfare and rubble have been the traditional response to

the complex problem of subduing a city and defeating the hidden adversaries. Siege

warfare consists of isolating the city from its external resources, and starving the

population until they surrender. The second approach, rubble, consists of a methodical

reduction of a city by clearing the it block by block. If we look back in history, at

Aachen, Stalingrad, or more recently in Grozny, we can see that the rubble approach

completely destroyed the cities. This approach produced large numbers of casualties and

raised questions concerning accepted military means to accomplish political ends. LTC

Timothy Thomas, an analyst with the US Army Foreign Military Studies Office and a

Professor at the US Army's Eurasian Institute, stated in the July-August *Military Review*

article, "Grozny 2000: Urban Combat Lessons Learned", that "turning a major city inside

---

Trianor, *The Generals War: The Inside Story of the Conflict in the Gulf*, (New York: Little, Brown & Company, 1995), 408.

Russia into ruins raises serious questions about the nature of military-political lessons ."[8]

This approach makes reconstruction and city revitalization more difficult. Additionally, destroying a city may work in favor of the adversarial regime who could be viewed as a victim. This gives political significance to the issue.

In today's environment, where city inhabitants number in the millions, rubble approaches are not desired due to both the collateral damage to the city's infrastructure and the inadvertent loss of innocent lives. Therefore, is it possible to secure and control a city without destroying it in the process? Or more specifically, how do we defeat the adversary within the city while preserving the infrastructure and popular support in order to facilitate favorable conditions for post conflict operations?

Scope and Limitations

This study is a systems approach applied to urban operations. There are three main limitations. First, this study is not intended to compare, contrast or to otherwise critique other effects based (system) approaches. Other techniques such as the industrial web theory developed by the US Air Corps Tactical School (ACTS) for the air war in World War II, and Colonel John Warden's "five rings" concept adopted during the Gulf

---

[8] LTC Timothy Thomas compared and evaluated the Russian military performance between the Grozny operation in 1995 and 2000. He concluded that the Russian military had performed significantly better in 2000 by adopting lessons learned from their first encounter in 1995 (artillery, maneuver by fire, SOF), and by capturing key lessons from the NATO war in Kosovo (precision firing from afar). One significant lesson was that of the assault force. In 1995, Russian forces suffered tremendous casualties when it penetrated deep in to the city, only to be encircled and defeated in detail. Now, the attitude was that no soldier would enter the city until all the buildings were destroyed. Reconnaissance and SOF forces would enter the city and direct artillery and aerial bombs on targets. In his conclusion, he gave Russian military performance a "B-" in 2000 (up from a "F" and a "C" in 1995) he indicated that they could have done better had they not pounded the "city into ruble". "Turning a major city inside Russia into ruins raises serious questions about the nature of military-political lessons. Timothy L. Thomas, LTC, *Grozny 2000: Urban Combat Lessons Learned*, *Military Review July-August*, (2000), 57-58.

War, primarily focused on the adversary's war-making ability. [9]   These approaches were not specifically directed at the internal systems of an urban environment. The systems approach developed in this paper should be used to augment existing techniques, such as those above. It will facilitate planning efforts to solve problems in urban environments. The systems approach is neither air nor ground centric, but rather a technique that can be adapted to whatever means are available. The approach is meant to provide military planners, at the operational level, with a method of looking at complex problems. To be able to adapt the operational concept of effects based operations (EBO) into a planning methodology.

Secondly, this monograph assumes only one of many threat environments that may exist within a city. The spectrum of environments can range from total resistance to zero resistance. For example, friendly forces may encounter an environment where national feelings have been aroused and the population and the regime are united in the defense of their city. Friendly forces may also encounter a threat environment where

---

[9] "The most efficient way to defeat an enemy is to destroy, by means of bombardment from the air, his war-making capacity; the means to this end is to identify by scientific analysis those particular elements of his war potential the elimination of which will cripple either his war machine or his will to continue the conflict; these elements having been identified, they should be attacked by large masses of bombardment aircraft flying in formation, at high altitude, in daylight, and equipped with precision bombsights that will make possible the positive identification and destruction of pin point targets; finally, such bombing missions having been carried out, the enemy, regardless of his strength in armies and navies, will lack the means to support continued military action." David MacIsaac, *Strategic Bombing in World War Two*, (New York: Garland Publishing, INC., 1976), 7-14. Warden's five ring concept preached the idea that it was possible to win a war through aerial bombardment. Warden argued that it was possible to convince the enemy leadership to do what you want him to do by attacking his instruments of internal power. By attacking the rings from first to last one could win the war without a ground effort. The first ring (bull's eye) was the command and control and communications capability of the enemy. The second ring around the bull's eye represented the enemy's military and economic production capability. The third ring held the means of transportation, movement and distribution. The fourth ring is the population and its food sources. The fifth ring was the least important of the target array; the enemy's military forces. The purpose of the ring approach was to persuade Saddam Hussein to pull his troops out of Kuwait and sue for peace—without a ground war. Michael R. Gordon and General Bernard E. Trianor, *The Generals War: The Inside Story of the Conflict in the Gulf*, 77-80.

only the regime within the city is resolute and the population is held in check by the regime's security organizations. Still another threat environment may be that the adversarial regime departs the city and continues its struggle in a protracted method through indirect action. Regardless of the threat environment the systems approach presented here should provide military planners with adequate tools to facilitate planning. As the example used throughout, this study has adopted the second environment mentioned above, which assumes that the regime and the population do not share the same resolve in defending the city.

Thirdly, this study does not advocate new doctrine, nor does it negate existing techniques in solving complex problems. However, this study does find its roots in doctrine and provides the operational commander and his staff with an approach to manage the complexity of the urban environment. This paper hopes to identify a more efficient manner to bring about the control of a city.

CHAPTER TWO

The Environment

Chapter two presents the essential elements of the Urban Operational (UO) environment. Four main points are addressed. First, the chapter addresses past US Army urban operation doctrine. Second, it defines urban operations in the contemporary environment. Thirdly, it analyzes two historical case studies specific to urban operations. Lastly, it describes the urban environment within the systems framework.

Previous Doctrine

This section orients the reader to previous doctrine applied to urban operations. It is important to understand military approach in the past to understand the impact to the

urban environment. While many of these techniques are still utilized, past doctrinal concepts are no longer feasible today.

The United States Army has attempted to describe the future and current environment of urban operations. The 2001 edition of FM 3-0, *Operations,* explains that urban operations include offensive, defensive, stability, and support operations. These are conducted in a topographical complex and terrain consisting of manmade construction and high population densities.[10] FM 3-0 devotes a total of three paragraphs to the discussion of urban operations as it is related to complex operational considerations. Reading the three paragraphs it becomes clear that the Army considers urban operations as complicated, full-spectrum operations.

Due to this complexity, previous doctrine relating to urban operations has advocated urban avoidance. FM 90-10, *Military Operations on Urban Terrain,* written in 1979, stated specifically that "built up areas are isolated and bypassed."[11] COL (R) Gregory Fontenot who currently leads Operation Group Foxtrot, Battle Command Training Program noted during one training session that indeed, most professional soldiers that have served in the past several centuries realized that cities are no fit place for armies.[12] Armies lose every advantage they possess when they enter a city. From the

---

[10] US Army, FM 3-0, *Operations*, (Washington, D.C.: Government Printing Office, 2001), 6-19.

[11] U.S. Army, FM 90-10, *Military Operations in Urban Terrain,*, (Washington, D.C.: Government Printing Office, 1979), 1-1.

[12] COL Fontenot is chartered by the Chief of Staff of the Army to instruct all Corps and below commanders and staffs on urban operations. He was recognized by LTG Scott Wallace, V Corps Commander, as one of the Army's leading subject matter experts on urban operations. Scott W. Wallace, "Opening Comments" (presented at a seminar on urban operations, Heidelberg, Germany, 5 November 2002).

moment armies transition from landscape to cityscape the environment turns against them.[13]

Addressing Urban Areas

The changing thought process relating to urban operations is summed up in the replacement to FM 90-10, FM 3-06, *Urban Operations,* which specifies "Army forces will likely be required to conduct operations in and around large urban areas."[14] The military can no longer avoid or bypass urban environments. Rather we must face the fact that this environment has significant implications at the tactical and operational levels.[15] Specifically, the environment will force militaries to conduct full spectrum operations relative to their ability to transition from combat to stability and support operations. During military operations in Mogadishu, Grozny, and recently in Afghanistan, military forces had to conduct urban operations. These cities' intact infrastructure supported both peace keeping or peace enforcement operations as well as the transition and support for interim or permanent governments.

Urban Operations Defined

This section defines urban operations and addresses four major points. The first sub-section defines the environment and provides an explanation of a city's characteristics. This will be followed by the joint role in urban operations and the city's

---

[13] For more on this see Major General Robert H. Scales, Jr., *"The Indirect Approach: How U. S. Military Forces Can Avoid the Pitfalls of Future Urban Warfare," in Future Warfare (Carlisle Barracks, PA: U. S. Army War College, 1999.* Roger J. Spiller, *Sharp Corners: Urban Operations At Century's End*, (Fort Leavenworth: U.S. Army Command and General Staff College Press, 2000)), 178-181.

[14] FM 3-06, *Urban Operations*, 1-2.

[15] Gregory Fotenot, COL (R), "The Foundation: Case Studies in Urban Operations" (briefing presented to the faculty of CGSC, Fort Leavenworth, Kansas, 30 January 03).

role in full spectrum operations. Consideration must be given to eventual transition to either post conflict operations as well as political limitations. The next point is the operational context of city fighting and the possible impact to the nation. The last sub-section focuses on consequences relative to military operations within a city specific to the issue of density and infrastructure.

<u>Defining an Environment</u>

Military forces can no longer bypass urban areas. Also, the military may be required to utilize the city's infrastructure to facilitate future operations. The environment must be defined to understand the impact of fighting within the area.

Urban areas will increase. Medium towns will become cities. Cities will become megalopolis.[16] In many places, this rapid change has overburdened already weak infrastructure, and fragile financial bases.[17] Planners must remember this in order to create a seamless transition and destruction of this infrastructure is minimized.

George J. Mordica, a senior analyst for the Center for Army Lessons Learned (CALL), has written and conducted research on UO. He devised a clear and succinct definition of a city: urban airspace, supersurface (buildings), surface (street level), and subsurface (sewers, tunnels, subways).[18] One element not included in this definition is the civilian population that is supported by the above elements.

---

[16] Spiller, *Sharp Corners: Urban Operations At Century's End*, 22 - 24.

[17] Department of Defense, Joint Publication 3-06, *Doctrine for Joint Urban Operations,* (Washington, D.C.: Government Printing Office, 2002), vii.

[18] "The effect on the populace has always been traumatic, whether the people were participants or simply bystanders caught in the misery of it all. In earlier times, laying siege to a city and then taking it was the objective. Since World War II and the refinement of maneuver warfare, cities have become a restricted area that are more easily bypassed or reduced than taken. Part of the reason for this gradual change in strategy has been the cost associated with military operations on urbanized terrain (MOUT)." George J. Mordica II, *It's A Dirty Business, But Somebody Has To Do It*. *CALL Newsletter 99-16*, (1999) i.

Joint Urban Operations

Urban areas directly affect the operational art. Because of their complexity joint operations may be involved.[19] Mordica states, "In war, urban operations are often difficult and costly in terms of personnel and equipment, and require a full suite of military capabilities; urban areas are also increasingly the sites of military operations other than war (MOOTW)."[20]

These operations on opposite ends of the military spectrum can even occur both simultaneously and in close proximity. Operations conducted by the Air Force on specific targets may hinder future operations conducted by ground forces in combat within the city or their transition to support or stability operations. Therefore, the assessment of the urban environment must address the application of military resources and the effect of these resources must be coordinated to support future operations. Direct control of all resources and combat multipliers has an impact on future operations and therefore may be restricted. The aggression and destruction that could be unleashed on a city will directly affect the ability of other forces to conduct future operations. The use of the Air Force to attack specific targets within the city, whose infrastructure could eventually be used by civil military organizations or ground forces, must be turned into controlled aggression. Destroying a city with little regard to future operations is no longer a feasible course of action. Military actions in some cities may endanger the very

---

[19] Ibid., viii.

[20] Ibid., viii.

17

existence of the nation.[21] No longer is it acceptable to destroy a city while trying to control it. Rather alternative methods must be developed to achieve the mission.

Ground forces are likely to conduct operations in and around urban areas, according to US doctrine "not as a matter of fate but as a deliberate choice linked to national objectives and strategy and at a time, place, and method of the commander's choosing."[22] Army forces will conduct these urban operations either as one component of a larger operation or as a single action focused on a specific urban environment. Major Army urban operations in the future are likely to be part of a joint and multinational effort. These operations will likely require interagency and civil-military synchronization that may include the full spectrum of Army operations. Commanders of these major Army operations must determine if these operations are essential to the mission and, if so, ensure that they are carefully integrated into land campaign planning.[23]

The Operational Context

The operational commander may have the most influential impact on the transition to post conflict operations.[24] According to Joint Publication 3-06, *Doctrine for Joint Urban Operations*, commanders plan, conduct, and sustain campaigns and major operations to accomplish strategic objectives within theaters or other operational areas. A Joint Force Commander (JFC) may conduct Joint Urban Operations (JUO) either as a

---

[21] Mr. Lester W. Grau and Dr. Jacob W. Kipp**,** *Urban Combat: Confronting the Specter***,** *Military Review,* (July-August 1999), 1.

[22] FM 3-06, *Urban Operations,* I-2

[23] Ibid., I-2

[24] Mr. Lester W. Grau and Dr. Jacob W. Kipp**,** *Urban Combat: Confronting the Specter, Military Review***,** 1.

major operation or as part of a campaign. The requirements and nature of urban

operations make unified action more difficult and complex and present the JFC with

significant challenges in the practice of operational art. [25] The massive amount of

resources available to the JFC may be better allocated if applied to effect or protect

critical systems of the urban environment.

During urban combat the commander is presented with additional strategic and

operational challenges - few of which technology can resolve. Soldiers tend to think

about combat in cities as just a matter of different terrain and tactics (different

conditions). We must change this mindset. The US Army's term "Military Operations on

Urbanized Terrain" (MOUT) understates the unique difficulties associated with urban

operations.[26] The focus of this term is on terrain. However central terrain may be to the

solution of tactical problems it has little to do with the operational problems within a city.

In urban combat a city's complex set of systems and high population densities create

significant problems.[27]

Military UO Consequences

UO problems lead to consequences. This section addresses three major points: the

complexity of a city which affects the entire nation; the issue of density within a city; and

lastly, infrastructure support of the city and the population.

---

[25] Ibid., II-3 & 4.

[26] Gregory Fotenot, COL (R), "The Foundation: Case Studies in Urban Operations".

[27] Historically, the city presents a very special type of problem for strategic and operational commanders and their staffs. As Michael Walzer observed, civilian populations frustrate the "war convention"—those rules that guide military conduct. The war convention is the moral underpinning of war and forms the basis for combat's rules of engagement (ROE). Walzer discusses the problem of military utility and proportionality against the backdrop of human rights for noncombatants. Mr. Lester W. Grau and Dr. Jacob W. Kipp, *Urban Combat: Confronting the Specter*, *Military Review*, 1.

National Impact of UO

Destruction of a city is not likely a feasible course of action either militarily or politically. A systems approach that avoids complete destruction should be considered as an alternative to current doctrine. Every city is unique. Some are robust and resilient, while others are fragile and unable to cope with daily demands, let alone military actions. Some cities, particularly in the developing world, can barely provide basic water, sewage, power, transport, garbage collection and public health services to their citizens. Also, military actions in some cities, such as Hong Kong, New York, Frankfurt, Seoul, Mexico City, Tokyo, and Singapore, would endanger the very economic stability of the nation— and possibly the planet. Military actions in smaller cities may have only local consequences. Therefore, military actions will have greater political, economic, sociological and commercial consequences in larger cities. Consequently, the operational commander will probably be constrained by various political dictates as well as coalition and interagency considerations.[28]

Density

The element of density must be considered in urban operations planning — density of structures, density of noncombatants, density of infrastructure, density of adversary forces, density of targets. Fires which can easily result in collateral damage may now be unacceptable. Distances are compressed to direct line of sight, often only a few meters. A very small linear area can contain a large adversary force, occupying in three-dimensional depth. Space may be measured in city blocks instead of kilometers.

---

[28] Ibid., 8.

Airspace will consist of layers, with the lower layer perhaps punctured by high-rise buildings or canalized by "urban canyons."[29]

Density and the complexity of a city environment cause changes in the process of attacking it. Today the technique of clearing house by house must generally be avoided. If a commander realizes that a city can be a system of systems then an alternative method of attack may be possible.

Infrastructure

Infrastructure is a supporting system for UO. It is composed of other systems. Urban infrastructure forms the city's foundation, and each component of infrastructure affects the normal operation of the population within the city, and the nature and long-term success of urban operations.[30] Planners at all levels must understand the functions and interrelationships of these systems.

For example, it may be necessary to protect electrical power facilities during initial combat operations, disrupt them during urban combat operations, and restore electrical power during the transition phase. The commander must determine the role and importance of key systems for each phase of the urban operation and for the end state.

According to Timothy L. Thomas, there are two categories of affects: the impact of individual services, facilities, or systems on planned urban operations; and the impact operations may have on key infrastructure and life support. The first category described is to the friendly military and their ability to support the plan or future operations using the city's services. The second impact is to the population or regime that uses the

---

[29] JP 3-06, *Doctrine for Joint Urban Operations,* II-7 & 8

[30] Timothy L. Thomas, *The Battle of Grozny: Deadly Classroom for Urban Combat, Military Review July-August* , V-1.

infrastructure to maintain their control of the city. In either case, the impact may be either direct or indirect. Direct, for example, may be the disruption of electrical power or the restoration of water service. Indirect may be the damage to buildings of cultural significance or the improvement of roadways.[31]

Historical Study

The tactics applied by military forces have changed only slightly in urban operations from World War II to the present. The military continues to apply an assessment and tactical framework that is common for all urban environments. An historical review of urban doctrine determined that the tactics proscribed the following: isolate the city area, seize a foothold, and expand the battlespace block by block until occupying the entire urban area and destroying the enemy.[32] In addition, the emphasis on firepower kept friendly casualties to a minimum and resulted in an eventual reduction of the city. Unfortunately, when enemy forces defended the city stoutly, there was infinite destruction with high casualties among noncombatants.[33]

---

[31] Ibid., V-1,

[32] Ibid, 1-17

[33] "The US Army published FM 31-50, *Attack on a Fortified Position and Combat in Town*s. This manual had the first formal discussion of how the Army viewed urban combat. It was based on the Army's limited experiences in the Mediterranean theater and the study of German and Soviet experiences on the Eastern front. FM 31-50 emphasized a deliberate pace, individual and small unit initiative, the liberal use of direct and indirect firepower, and decentralized command and execution. It focused on the urban area (as opposed to the environment); however, it did include policies towards the noncombatant population. The manual was also focused at the regimental combat team level. Complementing the doctrine of FM 31-50 was the 1944 operations manual, FM 100-5, which emphasized the importance of combined arms actions and the need for extensive reconnaissance of prepared and defended cities. The Army successfully implemented this doctrine in several major instances of urban combat, most notably the capture of the first German city, Aachen, and hundreds of small-scale urban assaults on cities, towns, and villages across France, the Benelux, and Germany. Army forces also successfully employed this urban combat doctrine during the liberation of Manila in 1945." Ibid., I-17

Aachen

     The systematic reduction of enemy forces within Aachen in October of 1944 by the 1st Infantry Division was achieved with few American casualties relative to the force they encountered. Although the German forces within the city outnumbered the American attackers by a ratio of 5 to 1, the two battalions of the 26th Infantry Regiment that fought in Aachen only lost 75 killed, 414 wounded, and had 9 missing in action. While the number killed was only 75, the aggregate number of casualties equated to the combat strength of one battalion (500). The Germans, on the other hand, suffered severely; out of a total force of 5000 garrisoned troops, over 3400 were taken prisoners with the remaining 1600 presumed dead. How was this possible? The Americans used a combination of aerial and artillery bombardment and small combined arms teams consisting of infantry platoons, tanks, and tank destroyers. This technique was learned from their struggles crossing the Normandy hedgerows. The battalions conducted a methodical advance through the city eliminating every German position they encountered. Infantry moved through buildings, blowing holes in walls, rather then risk the open streets. There was no attempt to avoid collateral damage, as the battalion commanders relied on patience and firepower to move from one block to the next.[34]

     The battle for Aachen, which began on the 11th of October with the bombing of the city by four Groups' of the IX Tactical Air command and almost 5000 rounds of artillery, ended only ten days later with the surrender of the city by Oberst Gerhard Wilck. The city, however, was rendered unusable by the civilian inhabitants of the town;

---

[34] Paul F. Gorman, "Aachen 1944: Implications for Command Posts of the Future" Command Post for the Future, Institute for Defense Analysis: 13, [paper on line]; available from http://cpof.ida.org/MOUT-Aachen-1944.pdf: Internet accessed 23 December 2002.

which now became the responsibility of the American forces to support. [35] Over 7000 civilians were evacuated during the fighting and were moved into displaced civilian camps located four miles from Aachen were they were registered, processed, and placed under military governance.[36]

With the release of FM 3-0, the Army has acknowledged that urban areas are a system of systems. By approaching these operations as US forces did during Aachen there is a realization that transition to post conflict operations is made very difficult. Transition becomes a problem if the gas, power, and water infrastructure are destroyed.[37]

Paris, 1944

It is possible to achieve the military end state of controlling a city without destroying it. This is not a new approach but rather has historical basis. The summer of 1944 confronted German General Dietrich von Choltitz with a dilemma. As military Commander of Greater Paris, he was to eliminate French Resistance internal to the city while simultaneously defending against approaching Allied units. Quite clearly, von Choltitz realized he had insufficient forces. To add to his dilemma Hitler demanded that he destroy the city. The general saw this action as needless. His responses to these multiple challenges included the traditional and innovative; in both cases his

---

[35] Ibid., 13

[36] For before and after pictures of Aachen that show the aftermath of the rubble technique utilized by the 1st Infantry Division the reader may visit the web page. Ibid., 14.

[37] Gregory Fotenot, COL (R), "The Foundation: Case Studies in Urban Operations".

identification of systems and means of applying them to density and infrastructure were of notable importance to the success he achieved.[38]

Choltitz's seniors directed the preparation for demolition, and later the destruction, of Paris' forty five Seine River Bridges. They were the only remaining crossing points over that waterway given Allied bombing of others outside the French capital. Aside from several of the structures being historical and cultural landmarks, premature destruction would trap German forces defending to the north, a second order effect that Choltitz used to justify his disobedience of orders demanding the bridges' demolition.[39]

The German general also recognized that some mission-critical elements were part of Paris's social rather than physical infrastructure: the leadership of the various resistance groups and the relationship between them. He understood that he lacked sufficient resources to defeat the many separate factions (i.e., it was impossible to achieve a density of German forces sufficient to defend all points of concern). Choltitz, therefore, chose the unorthodox approach of accepting an intermediary's offer of a truce with these groups (an asymmetric approach to this shortfall). Such an agreement provided some measure of the stability needed while Choltitz awaited promised reinforcements. Further, he realized that the resistance factions were by no means united in their goals. Communist elements sought a much different ultimate end than those looking toward a Charles DeGaulle-led Post War government.[40]

---

[38] Dr Russel W. Glenn, *Nuggetizing the Elephant: Managing Urban Complexity during Military Operations, (Working Draft)*, (Washington, D.C.: RAND Printing, 2002), 18.

[39] Idid, 19.

[40] Ibid, 19.

A truce thus set the French Communists (who sought an uprising so as to legitimize their claims of power) against others trying to buy time for Allied forces to arrive, forces that included Free French units supportive of De Gaulle. While this defense of the capital resulted in its inevitable failure, Choltitz succeeded in limiting unnecessary damage to the city, reducing the effectiveness of the resistance organizations fighting his soldiers, and maintaining withdrawal routes for units north of the Seine. The German commander's analysis in support of these efforts was effective in part due to his insightful identification of systems and critical capabilities that included elements of terrain, citizenry, and infrastructure.

Systems Framework

System of Systems

As JP 3-06, *Doctrine for Joint Urban Operations* discusses, this system of systems is depicted in the three main characteristics that all urban areas share. These characteristics are first the complex manmade physical terrain which are superimposed on existing natural terrain and consist of structures and facilities of various types. Second, a population of significant size and density which inhabits, works in, and uses the manmade and natural terrain. Lastly, an infrastructure upon which the area depends that may also occupy manmade terrain and provides human services and cultural and political structure for the urban area and often beyond, perhaps for the entire nation.[41] The military now recognizes that these three characteristics are intertwined and that they interact to make each urban area complex.

---

[41] JP 3-06, *Doctrine for Joint Urban Operations,* I-2

There are numerous areas where the city's systems overlap, interact and which, when affected, may have a direct impact on their support functions. During operations we can described the urban environment and adversary in terms of this systems framework. It is possible, therefore, to affect the system of systems components of terrain, human and infrastructure. Simultaneously, affects will take place in the elements that play a part in those systems: physical, political, economic, social, cultural, military, and security. Affecting these will impact the endeavor of the city.

Next, we will focus on how the systems, in the urban environment, overlap and interact. This will assist in a future analysis to determine which capabilities are absolutely necessary for the adversary to control the city.

Critical Capabilities

The upcoming section will identify where the systems (city's critical capability) overlap and interact within the concept of facilities. Additionally, it will begin to determine what capabilities are needed for the adversary to control the city. This is the beginning of the technique applied within a systems approach to urban operations.

Defining Facilities

In his paper *The Battle of Grozny: Deadly Classroom for Urban Combat,* Timothy Thomas describes a thought process for commanders to analyze facilities. This discussion revolves around Thomas' two categories of impact discussed earlier. The first is the impact of individual services, facilities, or systems on planned urban operations. The second is the impact operations may have on key infrastructure and life support in terms of systems.

While conducting an analysis of the city, the commander should first determine what factors make facilities important enough to be considered key or critical. These factors may include:

1. Whether and by whom a facility or service is required,

2. The probable effects of its neutralization or protection for use by friendly or adversary forces, and/or

3. Its importance to the noncombatant population.

Planners should take these factors and examine all systems and subsystems of the urban infrastructure, both physical and service, in order to identify the key or critical facilities and then affect or protect them. [42] Considerations for affecting the facilities will lead to a reduction in the regime's ability to maintain control of the city. Similarly, consideration for protection would be the need of the facility by coalition forces for future or post conflict operations.

The two points addressed in this section were initially a description of a city as a system of systems. This was followed by an explanation that systems can be critical capabilities of the larger city. These critical capabilities, when affected or protected, can lead to the ultimate control of the city. This is based on the fact that if the adversary no longer controls them he may ultimately lose control of the city itself.

Summary

In this chapter, urban operations have been defined as well as how the Army is incorporating UO into its doctrine. This has been done to identify and describe the urban environment within the systems framework. The 2001 edition of FM 3-0, *Operations,*

---

[42] Timothy L. Thomas, *The Battle of Grozny: Deadly Classroom for Urban Combat*, *Military Review July-August* , V-1., V-2 & 3

explains that UO includes the full spectrum of operations and that these are conducted in a topographical complex and terrain consisting of manmade construction and high population densities. It was important that we establish the basis for a systems approach by explaining the environment so planners understand the impact operations have on cities.

This chapter addressed four main points. Initially, it addressed previous doctrine applied by the US Army to urban operations. This led to a definition of urban operations in the contemporary environment which is significant to the conditions that forces will operate. The two historical studies provided an analysis of traditional approaches to urban operations and a primitive systems approach along with the consequences. Finally, this chapter led to a description and explanation of the systems framework that may be applied in a more contemporary environment

CHAPTER THREE

Systems Theory

> "I'm talking about attacking those things from which the regime draws its power but being very careful about it so that we don't get large bodies of young Americans caught up in house to house Berlin, World War II—type scenario."[43]

> LTG William S. Wallace, V Corps CG
> *New York Times*, March 7, 2003

This chapter discusses a systems approach to urban operations. Two main points are presented. First, this chapter addresses the doctrinal framework for the systems approach. Second, it describes general systems theory as it applies to this study by

---

[43] Michael R. Gordon, "Baghdad Targets Picked if Hussein Holes Up There," *New York Times,* March 7, 2003, sec 1A, p. 2.

defining a system and identifying the linkages between systems theory and doctrinal concepts.[44]

Doctrinal Framework

The system approach to urban operations draws directly from Joint and Army doctrine. It combines the elements of JP 5-00.1 *Joint Doctrine for Campaign Planning,* and FM 3-0 *Operations,* to structure a campaign plan designed to defeat an adversary within a city and to secure the city itself.[45]

Center of Gravity

JP 5-00.1 defines center of gravity as "those characteristics, capabilities, or sources of power from which a military force derives its freedom of action, physical strength, or will to fight."[46] Similarly, FM 3-0 defines center of gravity as "those characteristics, capabilities, or localities from which a military force derives its freedom of action, physical strength or will to fight."[47] Both definitions articulate the idea that the center of gravity is what provides a military force (friendly or adversary) its ability to act. The COG identifies the source of power and if it is defeated this may lead to decisive result.

---

[44] Working Group's Idea.

[45] *"Campaign Plan – A plan for a series of related military operations aimed at accomplishing a strategic or operational objective within a given time and space."* Joint Publication 1-02, *The Department of Defense Dictionary of Military and Associated Terms* (Washington D.C.: Government Printing Office, 12 April 2001), 63.

[46] Joint Publication 5-00.1, *Joint Doctrine for Campaign Planning*, (Washington, D.C.: Government Printing Office, 12 April 2001), II-8.

[47] FM 3-0, *Operations*, 5-7.

COG Actors

Joint and Army doctrine tie center of gravity to one actor: the military force. While this may be accurate in conducting combat operations, it may not address military operations other than war (MOOTW) where other actors are essential. For example, after the Implementation Force (IFOR) separated the warring factions in Bosnia in 1995-1996 and directed faction military forces to cantonment areas, the operational commander had to engage the faction's civilian leadership to gain compliance of the remaining aspects of the peace accords. To do this, analysis for government officials, police, and economic organizations had to be completed for each of the three factions: Bosniac, Serb, Croatian. Essentially, adversaries to the US military can come from more than one source. Thus, doctrine should not constrain planners by focusing only on military actors. Other actors such as crowds, media, political leaders, economic leaders, repressive regimes, criminal Groups', and terrorist organizations should be considered.

Once the adversary actor has been identified it becomes imperative to identify his COG. The COG concept is a vital analytical tool in the design of campaigns and major operations. According to JP 5-00.1, *Joint Doctrine for Campaign Planning,* planners should first identify a military end state, then identify the adversary's COG, and then design a plan. As this publication stated, "In fact, detailed operational planning should not begin until the adversary's COGs have been identified."[48] But how do we define the adversary's center of gravity in urban operations?

---

[48] JP 5-00.1, *Joint Doctrine for Campaign Planning,* II-8.

Defining the Adversary COG

Carl von Clausewitz, author of *On War*, clearly believed that the adversary's true center of gravity-"hub of all power"- was the adversary's army; specifically, where the mass of the army was located. Clausewitz believed that the army gave the adversary its strength and its freedom of action. Clausewitz, however, addressed the possibilities of other sources of power available to the adversary. These sources of power include the capital of the state and the allies of a state. Thus, there would be multiple COGs. Clausewitz considered the capital of the state, as the "hub of power" "for it is the center of all political and social activity in which a ruler exercises control over the population."[49] He stated that the defeat of any one of these sources of power- army, capital, and ally- would ultimately break the will of the adversary leadership and lead to the accomplishment of the friendly goals.[50]

Sun Tzu, in chapter III (offensive strategy) of *The Art of War*, stated that the most important thing in war was to attack the adversary's strategy, his alliances, his army, and lastly, his cities when there was no other alternative possible. Although he does not specifically state that these four objectives are called centers of gravity, one can infer from the attention he dedicates to these four areas, that these can be considered the adversary's sources of power.[51] While Clausewitz and Sun Tzu acknowledge the

---

[49] Carl Von Clauswitz, *On War*, (Princeton: Princeton University Press, 1984), 595-596.

[50] Ibid, 596.

[51] Sun Tzu would not favor a rubble approach in attacking a city. He would favor an approach that captures a city without assaulting it. Sun Tzu, *The Art of War*, (New York: Oxford University Press, 1971), 79.

importance of cities as a source of power to the adversary, what precisely is the source of power within the city?

Defining a City COG

Today state capitals are located in cities and house the state's government and policymaking bodies. These cities may be described as a system of systems. They are designed to support the economic, political, and life support needs of not only the inhabitants of that city but to the entire national population.[52] If we accept Clausewitz and Sun Tzu's idea that the capital of a state may be a source of power, and accept the idea that the capital city is a system comprised of many subsystems, what then is the center of gravity of the city? The answer may lie in the aim the adversary assigns to the city (defend to the last man, delay, control the populace, etc).

Shimon Naveh, the director and senior lecturer of the Department of History and Security Studies Program at the Cummings Center, suggested that the "aim" of any system is its main source of strength. If one refers to Joint and Army doctrinal definitions, as they relate to "sources of power" and "physical strength," it follows that the aim of the system may then be defined as the system's center of gravity. The aim becomes the COG because if it is destroyed the system no longer functions effectively.[53]

---

[52] "Whether a large metropolis or a small village, each urban environment has an identifiable system of components that constantly change and interact. This systems of systems consists of the terrain, the society, and the infrastructure that links the two". FM 3-06, *Urban* Operations, 2-2.

[53] Dr. Shimon Naveh is the Senior Lecturer of the Department of History and Security Studies Program and Director at the Cummings Center. His education includes a Ph.D. form the Dept. of War Studies, King's College, University of London. The title of his dissertation is: "From Vernichtungsschlacht to Airland Battle – the Evolution of Operational Theory". In addition he holds a Ph.D. in history from Columbia University, New York. Shimon Naveh, *In Pursuit of Military Excellence: The Evolution of Operational Theory*, (Oregon: Frank Cass Publishers, 1997), 16.

Shimon Naveh, author of *In pursuit of Military Excellence*, in discussing systems stated:

> The main source of strength is the absolute dominance of the aim. It is the aim which provides the cognitive cement to combine the loose complex of independent formations into a coherent operational unity and the decomposition of that cement will cause these formations to spin away from the common operational context.[54]

In addition, Naveh suggested that there are three basic methods in exploiting the system's dependence on the aim, with the result being the systems collapse. The first is through dividing and fragmenting the different elements of the system. The second is affecting several system elements simultaneously. And the third is identifying the exact points of strength and weakness in an opposing system in order to conduct maneuver strikes against the system's weakness. Naveh calls this operational shock.[55]

For example, if the aim of an adversary is to maintain control of the population within the city, then critical systems exist within the city to help accomplish this aim - be they military forces, police forces, or economic organizations. If enough systems are prevented from accomplishing their aim, then the larger system will collapse. Figure 1 represents a hypothetical capital city of a repressive regime with thirty-two sample systems.[56] The internal security systems (state police, local police, etc.) maintain law and order. Infrastructure systems (water, food, etc.) are regulated to reward compliance and punish noncompliance. Human systems (religion, culture) are monitored and restricted to
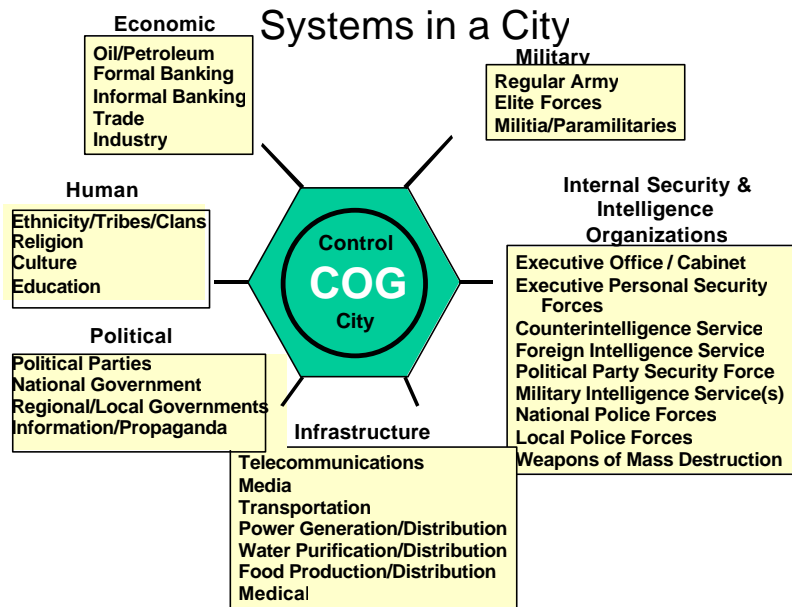
---

[54] Ibid., 16.

[55] Ibid., 19.

[56] Working Groups' Idea.

ensure adherence to government rules. All these subsystems work together in order for

the adversary to maintain control of the population.[57] If these subsystems were

fragmented, simultaneously attacked, or attacked at identified vulnerabilities then the

grander system would collapse.[58]

Figure 1: Systems in a City

Systems in a City

Economic
Oil/Petroleum
Formal Banking
Informal Banking
Trade
Industry

Military
Regular Army
Elite Forces
Militia/Paramilitaries

Human
Ethnicity/Tribes/Clans
Religion
Culture
Education

Control COG City

Internal Security & Intelligence Organizations
Executive Office / Cabinet
Executive Personal Security
    Forces
Counterintelligence Service
Foreign Intelligence Service
Political Party Security Force
Military Intelligence Service(s)
National Police Forces
Local Police Forces
Weapons of Mass Destruction

Political
Political Parties
National Government
Regional/Local Governments
Information/Propaganda

Infrastructure
Telecommunications
Media
Transportation
Power Generation/Distribution
Water Purification/Distribution
Food Production/Distribution
Medical

This study assumes that the center of gravity for a repressive regime is the ability

of the regime to maintain control of the population within the city. With this definition of

---

[57] A subsystem is simply a system within a greater system. When we refer to a city for example, the medical system, power distribution system, and transportation system all become part of the larger city system. Subsystems can either be physical or informational. Systems like a water treatment plant or a power distribution plant are physical in nature -- they are composed of physical resources. Systems like media and computer networks are informational in nature -- they are composed of information and data. While the computer is a physical device, the information it contains can be viewed as an informational system. Ibid.

[58] Working Groups' Idea.

COG, can doctrine provide us a framework to help identify the COG's capabilities,

requirements, and vulnerabilities?

COG Analysis: CC, CR, CV

Joint Publication 5-00.1 provides an analysis tool that links the concepts of center

of gravity (COG) with critical vulnerabilities (CV).[59] The discussion begins with the

identification of the adversary's COG. The COG possesses certain capabilities that

provide the adversary with the necessary resources and power to promote its freedom of

action. These capabilities are essential to the accomplishment of the adversary's assumed

objective(s) and are known as the COG's critical capabilities (CC). The COG's critical

capabilities in turn require essential resources and abilities in order to be fully

operational. These are called critical requirements (CR). Those requirements that are

deficient, vulnerable to attack, and lead to a decisive result are called critical

vulnerabilities (CV).[60] These CVs become essential when attacking the adversary's COG

and may be associated with an operational decisive point. A decisive point is defined as

"a geographic place, specific key event, or enabling systems that allows commanders to

---

[59] The JP 5-0 draft currently contains this COG analysis tool and will most likely be included in the next JP 5-00 release. Joint Publication 5-00, *Doctrine for Joint Planning Operations,* 2nd Draft, (10 December 2002), III-7.

[60] Critical Capabilities are those adversary capabilities that are considered crucial enablers for the adversary's COG to function as such, and are essential to the accomplishment of the adversary's assumed objective(s). Critical Requirements are those essential conditions, resources, and means for a critical capability to be fully operational. Critical Vulnerabilities, on the other hand are those aspects or components of the adversary's critical capabilities (or components thereof), which are deficient or vulnerable to or significant results, disproportionate to the military resources applied. In general, friendly forces must possess sufficient range (i.e. operational reach) and combat power to take advantage of the adversary's Critical Vulnerabilities. otherwise, these weaknesses cannot be targeted as physical objectives that are key to mission accomplishment. JP 5-00.1, *Joint Doctrine for Campaign Planning*, II-7.

gain a marked advantage over an enemy and greatly influence the outcome of an

attack."[61]

In our previous example we identified the center of gravity of a hypothetical

regime to be the aim of controlling the population within the city. We identified thirty-

two sample systems that provide the regime leadership the ability to control and lead the

population. If we use the definition provided above by JP 5-00.1, these thirty-two

systems become the COG's critical capabilities (CC). These systems can be placed into

general categories based upon what they provide the population, government, or society

as a whole. The categories developed by the authors are: economic, military, human,

political, infrastructure, and internal security and intelligence organization. These should

not, however, be confused with capabilities.[62] Depending on the problem, condition, or

situation more systems can either be identified or deleted from this list; this is done to

ensure only the systems that are critical to the COG are considered in the analysis. This is

the first step in a systems approach.

The next step is to identify the critical requirements (CR) for each of these

capabilities (systems) in order to help us identify critical vulnerabilities (CV). It is this

process that we will discuss in greater detail, but first we need to define what is meant by

a system, and what the components of a system are. With the help of Ludwig von

Bertalanffy's general systems theory, we will determine the CRs and CVs for any system.

---

[61] FM 3-0, *Operations*, 5-7.

[62] Working Groups' Idea.

General Systems Theory

Urban environments combine the tremendous challenges of conventional combat with the complexity of the three-dimensional terrain, constrained maneuver space, and the high density of non-combatants on the battlefield. Within this environment, we also confront a thinking enemy, who may or may not be constrained by the laws of land warfare. Systems theory provides planners a methodology designed specifically to deal with the complexity of urban operations.[63] It is a systematic approach of analyzing the many variables within the city in order to identify which variable, if affected, would result in an advantage for the commander. This theory is the basis for the systems approach of seizing a city without destroying it.

Concepts of Systems Theory

General systems theory finds its origin with Ludwig von Bertalanffy. In his book *General Systems Theory,* first published in 1968, Bertalanffy discussed the need for a theory that would facilitate study across the different fields of science. Since science was moving towards separate specialties it was difficult to analyze and coordinate knowledge from one field of science to the next. In order to advance discussion between the separate sciences, Bertalanffy was looking for a common base, or doctrine, which would identify

---

[63] M. Mitchell Waldrop earned a Ph.D. in elementary particle physics at the University of Wisconsin in 1975, and a master's in journalism at Wisconsin in 1977. From 1977 to 1980, he was a writer and West Coast bureau chief for Chemical and Engineering News. From 1980 to 1991, he served as a senior writer at *Science* magazine, where he covered physics, space, astronomy, computer science, artificial intelligence, molecular biology, psychology, and neuroscience. He is the author of *Man-Made Minds* (1987), a book about artificial intelligence; and *Complexity* (1992), a book about the Santa Fe Institute and the new sciences of complexity. Complexity as defined by Waldrop is " a great many independent agents interacting with each other in great many ways." He further discusses the concept of complex systems being those that can spontaneously self-organize, are adaptive in nature, and actively attempt to turn whatever happens into an advantage. It is this ability to adapt that planners should used a systems approach to look at second and third order effects of complex systems, to ensure the desired impact on one system leads to an undesired result on another system. Mitchell M. Waldrop, *Complexity*, (New York: Simon & Shuster, 1992), 6.

common principles that were valid for all systems regardless of function.[64] In essence,

Bertalanffy attempted to share models from one field of science to the next field of

science to help in analysis and study.

Defining a System

Bertalanffy defined systems theory as the study of the complex interrelationship

between the different elements within a system. To help in analysis and assessing

systems, Bertalanffy discussed three criteria that must be identified. The first is to

identify the elements that are involved in the system. In our example, this would equate

to the thirty-two city subsystems. The second is to identify the specific characteristics

that define those elements. This would be each subsystem's general identity, such as

military, political, infrastructure, or economic. The third parameter, and the most

important in the discussion of system theory, is to identify the interrelationship between

systems and subsystems. For example, systems often share resources, depend on outputs

from other systems, and often produce outputs that are needed as inputs for other

systems. It is the interrelationship that needs to be identified in order to determine

potential second and third order effects.[65] These relationships will be explored more in

detail later in this chapter. [66]

---

[64] Ludwig von Bertalanffy, *General Systems Theory*, (New York: George Braziller, 1993), 33.

[65] First order effects result immediately from an action. The results are directly attributable to a military
attack on a target or other actions at a specific location and occur immediately or very nearly immediately
after the specific actions. Second/third order (Indirect Effects). Those effects that are created through an
intermediate effect or mechanism will thereby produce a final outcome or result. Simply stated a causes b,
causes c, causes --. Furthermore, second and third order effects are indirect effects, which may be
functional, systematic, or psychological in nature. Indirect effects tend to be delayed and typically are
more difficult to recognize that direct effects. Depending on the situation, indirect effects may occur over
an indeterminate period of time. An example of second and third order effects would be disruptions in the
electric grid, which yields rolling backouts that disrupt petroleum deliveries to airfields and that disrupts air

Open and Closed Systems

In addition, Bertalanffy defined two basic categories of general systems, the open and the closed system. A system that is connected to its environment by means of resource flows (or information flows) is called an open system. "An open system is defined as a system in exchange of matter with its environment, presenting import and export, building-up and breaking down of its material components."[67] A city power plant would be an example of an open system; it receives raw resources (oil, coal) from the environment and then transforms it into electricity that it eventually pushes back out into the environment. A closed system, on the other hand, is a system that is isolated from the environment and will not be discussed in detail during this paper.

The Six Components

The number of elements within an open system varies depending on the system being analyzed; one-cell systems, for example have fewer elements then complex multi-cellular systems do. However, open systems generally maintain the following basic components: an input component, a transformation component, an output component, an information management component, a feedback loop component, and a leader component. The need for inputs and outputs reflect dependency on the environment. The interacting elements indicate that components depend on each other within the system and therefore must work together. Each open system has boundary components - components that span the gap between the inner workings of the system and the

operations. Edward C. Mann III, Gary Endersby, Thomas R. Searle, *Thinking Effects: Effects Based Methodology for Joint Operations*, *CADRE Paper No. 15*, 32 – 33.

[66] Ibid., 31,54.

[67] Ibid., 141.

environment. It is at these components where potential linkages between systems and subsystems can be identified. [68]

Inherent to any system is the information management component, which monitors the transformation of date to ensure that the system meets the objectives established by the leader. These controls help the system respond to the completely unpredictable events that may occur in its environment. For example, the destruction of an electrical power grid, not only causes an increase in demand of power generators and the demand for fuel, but also causes fuel to be rationed, which may cause civil unrest. [69]

Here is where theory begins to overlap with the systems approach in practical application. In our previous example we identified the COG of a regime to be the aim of controlling the population within the city. The critical subsystems needed to allow the center of gravity to exist are the critical capabilities (CC). We identified thirty-two subsystems that provide the regime this capability to control the population (Figure 1). Using the system definition as outlined above we derived the CRs (Blue) and CVs (Red) of one CC: Power Generation/Distribution (Figure 2). [70]

---

[68] Working Groups' Idea.

[69] Ibid.

[70] The chart in figure 2 was developed during the recent planning mission of six officers assigned the task of solving the problem-"how to seize a city without destroying it" along with the basics provided by Jamshid Gharajedaghi, *Systems Thinking: Managing Chaos and Complexity,* (Boston, Butterworth & Heinemann, 1999), 19.

41

CC: Power Generation/ Distribution   Aim: Control COG   Actor: **Regime**

Purpose of System: An instrument of control; power will be denied or provided dependant on compliance to established rules; designed to support the political and social control of city.
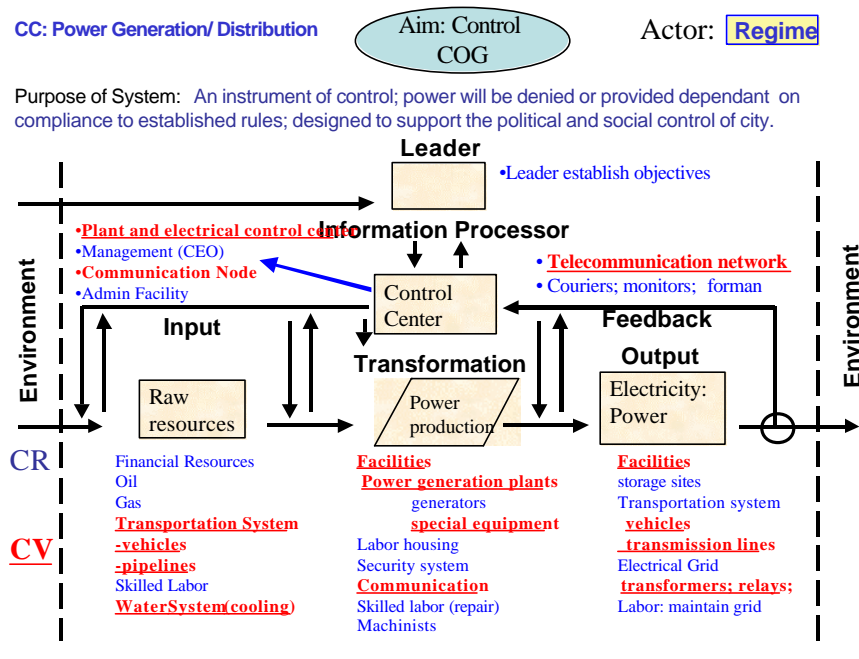
Figure 2: System Worksheet (Power Generation/ Distribution)

In Figure 2, we examine the power generation/distribution subsystem. This subsystem requires resources in order to function; these are known as critical requirements (CR). By determining the requirements at each system component we can then refine our effects we want to achieve on the system.[71] For example, we may be able to degrade the power generation system by affecting the system at the input component by denying it raw resources. This would preserve the system's facility infrastructure for later use. We can also degrade the system at the output component by destroying the transformers or power relay stations. In fact, we can degrade the system at any component dependant on what effects we want to achieve. Any of these CRs that are vulnerable to attack, with significant affect on the power system's operations, would be a

---

[71] Ibid.

CV that could become a target/objective and may be a decisive point in a line of operation.[72]

The system worksheet (Figure 2) allows us to determine these CVs and determine potential targets/objectives. These CVs are the keys in attacking the adversary COG. In decisively engaging the selected CVs, an urban campaign plan will disrupt and eventually destroy the adversary's critical requirements, ultimately defeating the COG and causing the adversary to lose its ability to control the city.[73] The worksheet also provides planners with a tool to identify interaction between the components of the subsystem and, in fact, with other subsystems.

Once a system worksheet is completed for each subsystem identified (CC), common critical requirements will appear. These common nodes then signify the linkages and interaction among the subsystems. For example, above we identified the transportation system and water system as input requirements and identified the output as electricity. The majority of the subsystems within the city require transportation, water, and power to function. They all are linked and interact with each other.

In this section we addressed the six components of an open system. During this discussion we provided an example of a system worksheet (Figure 2). The system worksheet is a tool planners can use to identify linkages. It is a way to identify and list

---

[72] Although already defined, there is a requirement during this discussion to put the term CV into perspective during this particular application. Critical Vulnerabilities: Critical Requirements or Components thereof which are deficient, or vulnerable to neutralization, interdiction, or attack (moral/physical harm) in a manner achieving decisive results – the smaller the resources and effort applied and the smaller the risk and cost, the better. Dr Joe Strange, *Centers of Gravity & Critical Vulnerabilities: Building on the Clausewitzian Foundation So That We Can All Speak the Same Language*, *Perspectives on Warfighting Number Four Second Edition*, (Quantico: Defense Automated Printing Service Center, 1996) 64-65.

[73] Working Groups' Idea.

critical requirements and critical vulnerabilities that may be attacked to affect the critical capabilities.

In the upcoming paragraphs we will discuss how systems are interdependent and how they interact with each other. Identifying which interaction type exists can lead planners to assign priorities when considering which requirement to affect. In a process that relies on affecting certain targets, this becomes critical in order to influence change within the environment.

Systems Interdependence/Interaction

Dr. James D. Thompson, author of *Organizations in Action*, discussed three distinct types of interdependence that exist between systems: pooled, sequential, and reciprocal.

Pooled

The first interdependence type is pooled. Pooled interdependence is when each subsystem within the greater system works independently to reach the established goal; the only linkage that exists is the requirement for common resources such as money and raw material. These systems compete against each other for these resources and require a higher authority to assign priorities.[74]

Sequential

The second type of interdependence that may exist is called sequential. Sequential interdependence is when a subsystem requires the output of another system as an input in order for it to function; it is a precursor relationship from one system to the other. The first system must perform correctly for the second system to perform

---

[74] James Thompson, *Organizations in Action* (New York: McGraw-Hill, 1967),40.

correctly. For example, the oil refinery system produces fuel (output) in order to be used by the transportation systems (input) within the city to operate.[75]

Reciprocal

The third type of interdependence among systems is reciprocal. This is where the output of system A acts as an input to system B (sequential), and the output to system B is the input back to system A. For example, the water purification/distribution system requires power to operate properly in order to produce cooling water for the power generation/distribution system.[76]

Planners can assign priorities as to which system affected will have the greatest impact. The interaction type establishes linkages that allow for the assessment of second and third order effects. For example, destroying a critical requirement that displays the characteristics of sequential or reciprocal interdependence may produce a quicker affect on the entire system (also increase second and third order effects on other systems) then if one destroys a requirement possessing a pooled characteristic.

Lines of Operation

Once second and third order effects have been identified and priorities have been applied to each target, a process is required in the systems approach to assist the planner in determining sequencing. An existing framework within Army doctrine is the use of lines of operations. Planners will understand that logically sequencing the targets increases desired affects. Logical lines of operations provide a framework and

---

[75] Ibid., 40.

[76] Ibid.

arrangement for selecting objectives when positional orientation to an enemy has little relevance.

Once critical vulnerabilities of systems have been identified, how does the commander go about affecting them? FM 3-0's lines of operation provides a framework to determine which vulnerability (target/objective) to affect and in what sequence in order to achieve the military objective. According to FM 3-0, lines of operations connect friendly forces with its base and its ultimate objectives through a series of decisive points.[77] An operation may have single or multiple lines of operation. Multiple lines provide the commander with flexibility in the execution of his operation and make it difficult for the enemy to determine friendly objectives; it helps the commander visualize actions between military and nonmilitary means. The concept of decisive points allows commanders an opportunity to attack the adversary's COG indirectly.[78]

Logical Lines

As stated in FM 3-0, "When positional reference to an enemy or adversary has little relevance, commanders may visualize the operation along logical lines."[79] Specifically, FM 3-0 states that logical lines of operation (LLO) link affects in a logical sequence to achieve the desired end state; they link multiple objectives and actions with the logic of purpose. These logical lines of operations allow the commander to focus on

---

[77] As defined earlier these decisive points may be a geographic place, specific key event (an effect), or enabling system that allows commanders to gain a marked advantage over his enemy. FM 3-0, *Operations*, 5-9.

[78] Ibid., 5-9.

[79] Ibid., 5-9.

those objectives that are critical in order to achieve the mission goals.[80] They set the

conditions for follow-on operations and can either be a shaping or decisive LLO.[81]

Where is the value added for lines of operations in a system's approach? Lines of

operations provide a framework to the commander to determine which critical

vulnerability (either a decisive point or a component of one) to affect and in what

sequence in order to achieve the overall affect of destroying the adversary's control over

the city. These lines allow the commander to truly focus on those objectives that are

critical in order to achieve the mission objectives.

Summary

System Defined
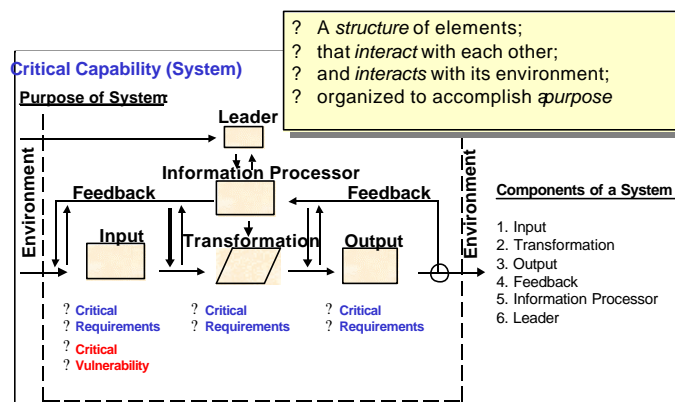
Figure 3: System Defined

In summary, systems theory provides the tools needed by the operational planner

to deal with the complexity of today's urban environment. Figure 3, integrates the

---

[80] Ibid., 5-9.

[81] Decisive operations are those that directly accomplish the task assigned by the higher headquarters. Decisive operations conclusively determine the outcome of major operations, battles, and engagements. There is only one decisive operation for any major operation, battle or engagement for any given echelon.

authors' systems approach to the COG-CC-CR-CV analysis as set forth in doctrine.[82]

With the Joint Doctrine JP 5-00.1 CC-CR-CV analysis tool, planners can select the

critical capabilities of a center of gravity. Next, planners can look at each capability as an

open system and identify the critical requirements associated with the six components of

the system. The planner has now gained the ability to affect the system at any component

part: input, transformation, output, feedback, information processor, or leader. Once each

of the subsystems has been analyzed and the requirements have been identified, linkages,

boundaries, and interdependencies between the systems can be acknowledged. These

interdependency types (pooled, sequential, or reciprocal) become targets that, if affected,

will degrade the adversary's center of gravity and become the greater system's critical

vulnerabilities.

Placing the adversary at a position of disadvantage and dislocating his power base

may prove to be enough to change the adversary's will into compliance. In fact, the goal

would be to produce a decision without serious fighting at all. Sun Tzu calls this the

acme of skill: "For to win one hundred victories in one hundred battles is not the acme of

skill. To subdue the enemy without fighting is the acme of skill."[83]

This analysis allows us to shock the adversary's greater system by affecting a

finite number of critical vulnerabilities. These vulnerabilities are incorporated within the

operational campaign plan as either decisive points or objectives incorporated in decisive

points and will be integrated into the campaign's line of operation.

Shaping operations at any echelon create and preserve conditions for the success of the decisive operation.
Ibid., 4-23.
[82] Working Groups' Idea.

[83] Sun Tzu, *The Art of War*, 77.

This chapter discussed a systems approach to urban operations. It explained the application and theory by presenting two main points. First, the chapter addressed the doctrinal framework for the systems approach. Second, it described general systems theory as it applies to this study. The next chapter describes the technique in practice.

CHAPTER FOUR

The Systems Approach Process

In this chapter two major points will be discussed. First, we will explain a way to put logical lines of operations (LLOs) and their linkages into practice. Second, we will discuss war gaming effects in a systems approach. At the end of this chapter planners will be able to take the theory and doctrines discussed in the previous chapter and apply them to a scenario. They will understand how attacking one component of a system affects other systems in a process to get from logical lines of operations to courses of action.[84] To do this we will address two points. Initially, we will address the application of LLOs and decisive points. Next, we will address the linkages within logical lines of operations. By applying these elements, planners will be able to affect each system within a city in a coherent fashion.

Logical Lines of Operations

Logical Lines of Operations and Decisive Points

The logical lines of operation link a series of desired effects. Each LLO has its own end state and specified purpose. The combined effects of the shaping and decisive LLOs will aid in achieving the overall end state of the mission. Figure 4 is an illustration of a set of shaping and decisive LLOs. These are not unique to an urban operation but in

---

[84] Working Groups' Idea.

this example they may apply to the coalition's ability to seize control of the city. It is a graphic depiction of the LLOs that link multiple objectives and actions. It synchronizes these along multiple lines, both decisive and shaping, in order to achieve the desired end state. This graphic provides the planner a way to identify and define a line of operation, tie it to an end state, and then define its purpose.[85]
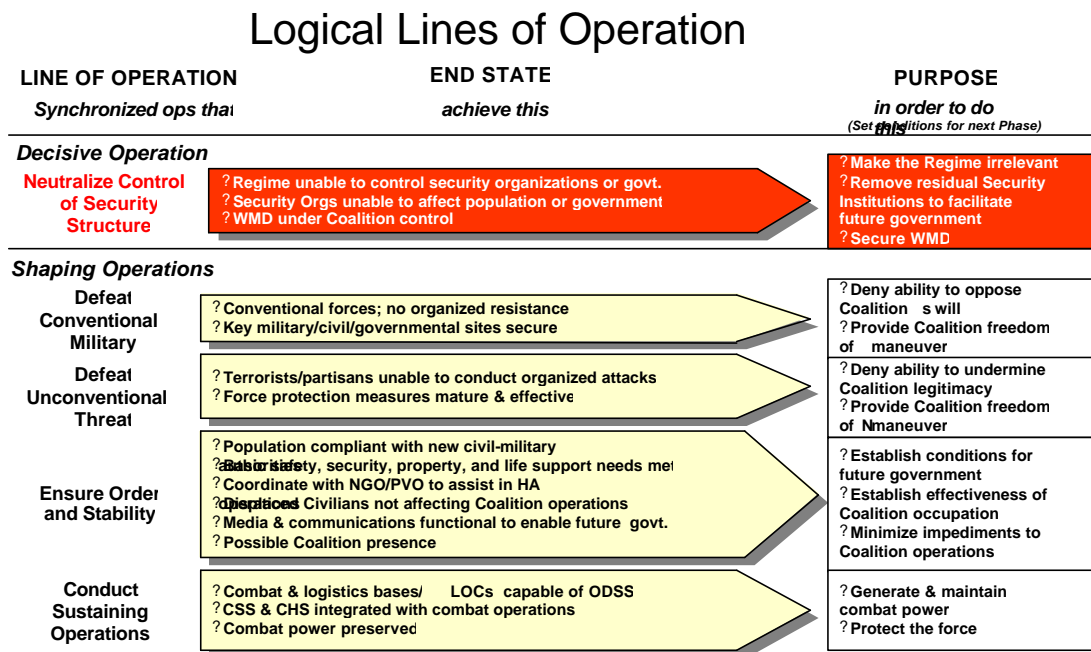
Logical Lines of Operation

LINE OF OPERATION	END STATE	PURPOSE
Synchronized ops that	*achieve this*	*in order to do this* (Set conditions for next Phase)

Decisive Operation

| **Neutralize Control of Security Structure** | ? Regime unable to control security organizations or govt.
 ? Security Orgs unable to affect population or government
 ? WMD under Coalition control | ? Make the Regime irrelevant
 ? Remove residual Security Institutions to facilitate future government
 ? Secure WMD |

Shaping Operations

Defeat Conventional Military	? Conventional forces; no organized resistance ? Key military/civil/governmental sites secure	? Deny ability to oppose Coalition's will ? Provide Coalition freedom of maneuver
Defeat Unconventional Threat	? Terrorists/partisans unable to conduct organized attacks ? Force protection measures mature & effective	? Deny ability to undermine Coalition legitimacy ? Provide Coalition freedom of maneuver
Ensure Order and Stability	? Population compliant with new civil-military authorities ? Basic safety, security, property, and life support needs met ? Coordinate with NGO/PVO to assist in HA operations ? Displaced Civilians not affecting Coalition operations ? Media & communications functional to enable future govt. ? Possible Coalition presence	? Establish conditions for future government ? Establish effectiveness of Coalition occupation ? Minimize impediments to Coalition operations
Conduct Sustaining Operations	? Combat & logistics bases/ LOCs capable of ODSS ? CSS & CHS integrated with combat operations ? Combat power preserved	? Generate & maintain combat power ? Protect the force

Figure 4: Logical Lines of Operations

Decisive points can provide for the linking of desired effects along a LLO to meet its end state. A planner must define the DPs purpose and end state. Defining these in the urban environment allows for the identification of specific targets and objectives that will achieve the desired effect. The decisive points should be listed sequentially, but not necessarily in chronological order. Figure 5 is an example that depicts these sequential

---

[85] LTC David Sutherland, LTC Jay Burton, MAJ Martha Granger, MAJ John Reynolds, MAJ David Tohn, MAJ Meg Vanasse,(Working Group), *A Systems Approach to Urban Operations Campaign Planning: Dealing with Complexity (Draft Article), 28 Jan 03, 7*.
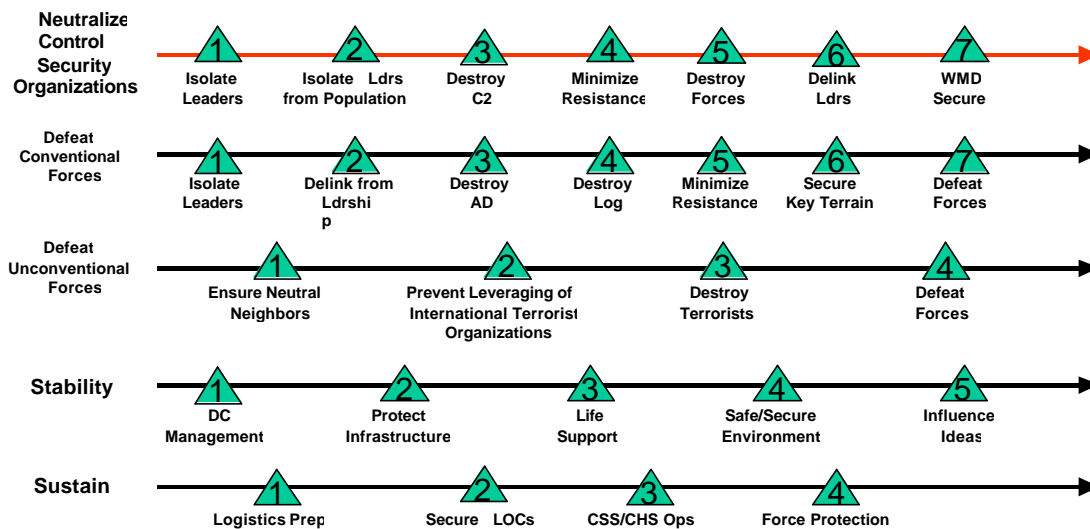
Lines of Operations and Decisive Points

Neutralize Control Security Organizations	1 Isolate Leaders	2 Isolate Ldrs from Population	3 Destroy C2	4 Minimize Resistance	5 Destroy Forces	6 Delink Ldrs	7 WMD Secure
Defeat Conventional Forces	1 Isolate Leaders	2 Delink from Ldrship	3 Destroy AD	4 Destroy Log	5 Minimize Resistance	6 Secure Key Terrain	7 Defeat Forces
Defeat Unconventional Forces	1 Ensure Neutral Neighbors	2 Prevent Leveraging of International Terrorist Organizations	3 Destroy Terrorists	4 Defeat Forces			
Stability	1 DC Management	2 Protect Infrastructure	3 Life Support	4 Safe/Secure Environment	5 Influence Ideas		
Sustain	1 Logistics Prep	2 Secure LOCs	3 CSS/CHS Ops	4 Force Protection			

Figure 5: Lines of Operation

The planner now has two tools that will help him visualize how to attack the enemy. Referring back to the regime and its control of the city we can use the following example as a way to diminish its control. On the decisive LLO the intent is to neutralize the control of the security organizations. By accomplishing this the regime is unable to control security organizations or the government that allow him to control the city. A secondary effect is that security organizations are unable to affect the population or the

---

[86] Working Groups' Idea.

government. An additional desired effect is the loss of control of Weapons of Mass Destruction (WMD) by the regime. The purpose is to make the regime irrelevant, remove residual security institutions to promote future governments, and to secure WMD. The planner can achieve this by logically affecting DPs shown in Figure 5 along the specified LLO. One or all of seven DPs can be achieved: isolate the leaders from each other and the population; destroy the regime's command and control; minimize resistance within the city by the population; destroy security forces; force leaders to work in different directions within the regime to cause confusion; and secure WMD. By synchronizing operations that accomplish these DPs, the planner is able to achieve the desired end state to accomplish the specified purpose.

Linking Logical Lines of Operation

The challenge in a systems approach to urban warfare is tying decisive points to specific CVs. Each system (critical capability) within the city is comprised of critical requirements (CRs). Within these CRs only a few critical vulnerabilities (CVs) can be successfully affected within time, space, and ROE constraints.[87]

The planner must determine which combination of specific CVs (targets/objectives), if destroyed, defeated, denied, degraded, or controlled, achieve the DPs purpose and end state. These CVs may be individuals, places or things, or perceptions. They are those things that, if affected, will have a direct impact on the critical capability, the system, and its ability to function. This requires a substantial, detailed knowledge of the city and the systems within it.[88]

---

[87]Working Group, *A Systems Approach to Urban Operations Campaign Planning: Dealing with Complexity (Draft Article), 8.*

[88] Ibid., 9.

Thus, the targets and objectives identified along each LLO are the result of the detailed Intelligence Preparation of the Battlefield (IPB), systems worksheets, and a targeting analysis process. The IPB must be detailed enough to support recommending effects (destroy, neutralize, etc.) that achieve the decisive point's purpose.[89]

In this section we have addressed two elements. First, we addressed the application of LLOs and DPs. Next, we addressed the linkages of logical lines of operations through the use of CVs tied to DPs. Understanding how to identify logical lines of operations is important. They are a way of synchronizing operations to achieve an end state, in order to accomplish a purpose. Given the complex interaction of the systems, the planner must understand how the attacks on one system or group of systems may play out across the urban environment. A modified version of war gaming – Effects-Based War Gaming – will help the planners in this process.[90]

War-Gaming Effects

Initially, we discuss the importance of war-gaming during a systems approach. This is followed by the linking of DPs and balancing effects. Then we address course of action development.

War-Gaming

In a complex operation with possibly contradictory mission guidance – defeat the

---

[89] Working Groups' Idea.

[90] Effects Based Operations are not focused on conquest or necessarily even warfare as traditionally defined. Essentially, EBO represents those actions taken against enemy systems designed to achieve specific effects that contribute directly to desired military and political outcomes. In a general sense, US forces have always had certain desired effects in mind when conducting military operations. However they often pursued military objectives without direct reference to appropriate effects that would create the conditions for achieving them and with little considerations of other effects that were created along the way. Edward C. Mann III, Gary Endersby, Thomas R. Searle, *Thinking Effects: Effects Based Methodology for Joint Operations*, *CADRE Paper No. 15*, 1.

enemy but do not destroy the city – decisive points will come into conflict with each other. This conflict is central to the complexity of the contemporary urban fight. It involves all of the considerations, and challenges facing the commander – balancing risk of failure, risk of excessive casualties, political and military opportunity, short-term and long-term gains and losses, and political and diplomatic repercussions. Given this, the challenge for the planner is to enable the commander to make a decision to accept, avoid, or create second and third order effects.

War-gaming by system provides one method of ordering the chaos of interactions.[91] Initially, done at a logical, effects level, an effects-based war game allows the planner and commander to assess systematically how one action will ripple throughout the systems within the city.[92] This method takes the familiar war-gaming process and modifies it slightly. Rather than the conventional action-reaction-counter action structure, it examines how connected systems will respond to a friendly action against a specific targeted system. This becomes the second order effect of the action. Then it determines how the systems will respond to the other systems' second order effects. This becomes the third order effects of the initial action.

The sample results worksheet below in Figure 6 illustrates how the effects of seizing a chemical weapons site ripple through only a few of the thirty-two systems

---

[91] War game — A simulation, by whatever means, of a military operation involving two or more opposing forces using rules, data, and procedures designed to depict an actual or assumed real life situation. JP 1-02, *Department of Defense Dictionary of Military and Associated Terms,* 473.

[92] Working Group, *A Systems Approach to Urban Operations Campaign Planning: Dealing with Complexity (Draft Article), 10.*

Wargaming Extract — Effects of Seizing Key WMD Sites		
System	**2nd Order Effect**	**3rd Order Effect**
Weapons of Mass Destruction Program	Leadership relocates remaining WMD to prevent seizure by Coalition	Regime prevents Coalition seizure of remaining WMD (using CCD); Regime employs remaining WMD
	Leadership employs remaining WMD (use or lose)	follow-on use more likely; increased sympathetic terrorist attacks against Western targets globally
Leadership Political Organization	Leadership has incentive for preemptive employment of remaining WMD	Leadership employs WMD; Party loses long-term legitimacy; Coalition cohesion & commitment increased
Conventional Military Operations	Confidence & morale degraded w/ loss of WMD combat multiplier	Forces relocate into city to mitigate force ratio overmatch; conducts isolated CATKs to regain sites
Medical Capacity	Inadvertent release of NBC during Coalition seizures causes MASCAL	Consequence management system overloaded; Leadership IO attacks Coalition operations
Trade & Black-Market	Loss of control of WMD sites (prior to Coalition seizure) leads to black-market smuggling of WMD	Smuggled WMD proliferated among sympathetic terrorist organizations & hostile state/sub-state/non-state actors

Figure 6: War-Gaming Extract

In this instance, the war-gaming reveals that an unplanned and un-sequenced effort to secure the chemical weapons sites may result in even graver consequences for the combat force and, at a larger scale, the entire Coalition as weapons potentially enter the black market.

With this assessment, the commander can make a deliberate decision to take one of three actions. One, accept the risk of use or lose or proliferation by the enemy because the immediate threat to friendly forces is unacceptable. Two, accept short-term risk and

---

[93] Ibid.

delay the site seizures until the preconditions are established to preclude early employment or proliferation. These conditions may include sufficient combat power to conduct simultaneous seizures and conducting information operations to preclude release of WMD by the enemy government. Or three, accept risk and void the storage sites until the regime has been defeated and the sites can be secured administratively. This option would require substantial information operations support and an aggressive force protection posture to mitigate the risk of weapons use.[94] In any case, the commander can include these considerations in developing specific courses of action for combat operation.

By establishing decision points the planner establishes the collection and decision integration that enables the commander the prospect to make a decision. The commander needs to determine if he is willing to accept or avoid second and third order effects. These effects are directly linked to the targeting of CVs. Although attacking the CVs may affect the system. The particular affect may not be acceptable to the commander at that given time.

Linking Decision Points and Balancing Effects

Understanding how an operation against a specific objective or target can ripple across LLOs and affect the rest of the systems provides the framework for determining and sequencing specific effects. This process is the logical result of the war-gaming and reflects the commander's decision in balancing all of the risks and benefits of specific objectives.[95]

---

[94] Ibid., *11*.

[95] Ibid., 12.

56

To provide an example we will discuss a short vignette that compliments the war-gaming example discussed in the previous section. It is effective in illustrating an effective employment of the linkage process and is visualized in Figure 7: Target Linkage.

Given the requirement to prevent the adversary from employing chemical weapons against Coalition forces, the commander determines that the two weapons delivery systems and warhead mating facilities must be controlled. The production and storage facilities pose a less immediate threat and are a lower priority.[96] Weapons release is transmitted to the site via strategic communications carried on the commercial telephone backbone, with the critical network switch located well away from the target sites. The commander determines that the sites must be isolated from the release authority and determines that the cost of rebuilding the telephone switch (and the impact on reconstruction and quality of life) is acceptable and targets the switch for destruction as a shaping operation for the site seizures.[97]

Conversely, electrical power supporting the sites would be destroyed as a shaping operation to reduce the defending forces' combat effectiveness. However, in this situation, the site employs a negative pressure atmospheric system to contain leakage. Moreover, the power distribution substation also powers a nearby hospital and state-run radio station. The risks of inadvertent release, collateral damage, humanitarian impact, and negative international response of cutting electricity to the hospital lead the

---

[96] Ibid., 12.

[97] Working Groups' Idea.

commander to establish the substation as an objective to secure, rather than destroy.

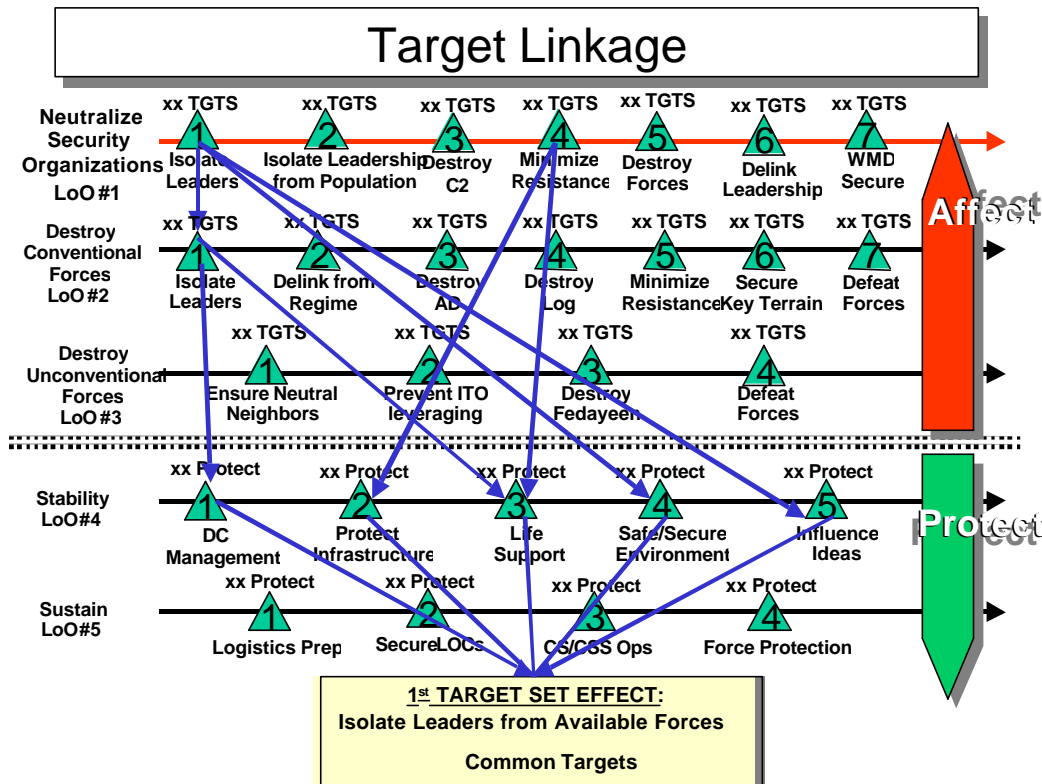Again, this operation is sequenced into the course of action.[98]

Target Linkage

Figure 7: Target Linkage

This scenario indicates how the specified effects (defeat, destroy, deny, or control) for an objective can be adjusted to balance the demands of more than one logical line of operation. Clearly, in many cases, operational risk and the potential for friendly

---

[98] Ibid.

casualties may drive the commander to a highly destructive solution with substantial post-conflict costs. However, these decisions should be deliberate and coordinated[99].

Ready to Develop Courses of Action

Understanding how actions on a single objective/target will affect the rest of the urban environment gives the planners and commander the necessary tools to develop courses of action (COAs). Moreover, by understanding the second and third order effects, the war-gaming enables the synchronization of combat to effectively mass effects at the right time and place. This is particularly critical, as was discussed in Chapter Two, if the campaign involves an air campaign that may destroy targets that are later necessary for ground combat or post-conflict operations.[100]

Planners can now develop a variety of separate and distinct COAs. For example, one COA may link and sequence targets designed to neutralize potential Weapons of Mass Destruction with minimal considerations for post-conflict reconstruction, while another may emphasize defeating armed resistance while setting the stage for post-conflict operations. A third general option may be a COA that focuses on building popular indigenous support to overthrow the adversary regime while only conducting limited conventional operations to enable the popular uprising. In any case, the analysis and war-gaming allows the commander to assess the COAs' feasibility, acceptability, and suitability in an integrated and holistic manner.[101]

---

[99] Ibid..

[100] Working Group, *A Systems Approach to Urban Operations Campaign Planning: Dealing with Complexity (Draft Article), 13.*

[101] Ibid., 13.

In this chapter two major points were discussed. First, we expanded on the logical lines of operations and their linkages. Second, we discussed war-gaming effects in a systems approach.

CHAPTER FIVE

Summary, Conclusions and Recommendations

The systems approach planning process is a means of providing order in the inherently complex urban environment. By superimposing a JP 5-00.1 critical capabilities analysis across a framework of LLOs, this model provides a structured and logical methodology. It allows the planner to move from vague operational guidance to specific campaign planning. Moreover, it may allow the commander to focus combat power to certain key areas and enemy force rather than having to fight through the entire city. Finally, it gives the planners a formal method for considering how an immediate tactical action can affect the long-term mission success. The effects-based systems war-game arms the planner with a contextual understanding of the mission objectives - how they relate to the city, the competing and complimentary lines of operation, and the overall mission end state.[102]

The purpose of this monograph determines if it is possible to seize a city without destroying it. The secondary purpose creates a systems approach to achieve military success in an urban environment. The scope of this monograph was limited to urban operations at the tactical and operational level in the planning process.

The fundamental problem with the current doctrine associated with urban

---

[102] Ibid., 13

operations is that it focuses on the tactical level of war and the basic house-to-house

clearing concept utilized in Aachen in 1944. The military, for the most part, considers

urban operations as a change in environment and not a distinct mission. There are some

differences in the urban conditions that require a different thought process. For planners

the two main differences are density and environmental complexity. Systems directly

affect the conduct of urban operations in a combat environment.

Additionally, during urban operations there are unique conditions that should

cause the military to think differently in order to avoid complete destruction of the city

and limit casualties to both combatants as well as noncombatants. Also, political

considerations play a significant role in the military decision making process. Thus, the

topics addressed in this paper are relevant to today's operating environment.

This systems approach does not necessarily represent a radical break from the

military's existing mental process or even the planning process itself. However it does

enhance these models. The current method of thought does not correspond with the

urban environments described in chapter two from an operational perspective. These

current methods omit an understanding to situations arising in urban operations and the

associated proportionality. Complete destruction of infrastructure or other systems within

a city during combat may have a dramatic impact on future operations or political

stability for the nation.

The objective of the systems approach to urban operations is to improve the

shortfall of the current doctrine in order to facilitate transition to post conflict operations

and limit casualties. Army planners often forget that every city is unique. Thus, each city

must be approached in a different way. The significance of UO is that military actions

have greater political, economic, sociological and commercial consequences in cities than in the countryside.

The systems approach facilitates the commander's ability to seize control of a city without destroying it. The approach can be seen as a graduated response matrix where critical requirements are affected in sequence in order to achieve a desired result. While it is impossible to determine to which threshold the adversary would relinquish his control of the city (aim), the systems approach does provide a method to gradually reach that threshold. In addition, the systems approach allows commanders to war-game and record the effects of an action throughout the entire greater system. This provides the commander with an analysis tool that captures potential second and third order effects that may or may not be desired; this should be incorporated in the commander's decision support matrix.

This study recommends this approach be adopted and integrated into existing planning models to provide commanders with an additional effects-oriented urban planning framework. To reinforce this planning approach, it is recommended that military units that attend the national training centers, urban training centers, and BCTP be presented with scenarios and conditions that facilitate seizing a city without destroying it. This infers that several systems, other then the enemy military system, be replicated in order to present the complexity commanders will face in conducting urban operations. The thirty-two systems identified in Chapter 3, can form the basis for this replication.

BIBLIOGRAPHY

Addington, Larry. *The Patterns of War Since The Eighteenth Century*. Bloomington: Indiana University Press, 1994.

Builder, Carl H. *The Prospects and Implications of Non-nuclear Means for Strategic Conflict*. Great Britain: Dotesios (Printers) Ltd, Bradforn-on-Avon, 1985.

Von Bertalanffy, Ludwig. *General Systems Theory*. New York, NY: George Braziller, 1969.

Clausewitz, Carl von. *On War*. Edited and translated by Michael Howard and Peter Paret. Princeton, NJ: Princeton University Press, 1984.

Checkland, Peter B. *Systems Thinking, Systems Practice: A 30-Year Retrospective*. New York, NY: John Wiley and Sons, 1999.

Checkland, P. B. and Scholes, J. *Soft Systems Methodology in Action*. New York, NY: John Wiley and Sons, 1990.

Checkland, Peter B. *Systems Thinking, Systems Practice*. West Sussex, UK: Wiley and Sons, 1999.

Cole, Ronald H. *Operation Just Cause: The Planning and Execution of Joint Operations in Panama*. Washington, D.C.: Joint History Office & Office of the Chairman of the Joint Chiefs of Staff, 1995.

Daft, Richard L. *Organization Theory and Design*. Cincinnati, Ohio: South Western College Publishing, 1998.

Doughty, Robert. *The Evolution of U.S. Army Tactical Doctrine*. Leavenworth: Center of Military History, 2001.

Friedman, Thomas. *The Lexus and the Olive Tree*. New York: Anchor Books, 2000.

Flournoy, Michele, *QDR 2001: Strategy-Driven Choices for America's Security*. Washington D.C.: National Defense University Press, 2001.

"Full Text: Bush's National Security Strategy." The New York Times.com, September 2002. <http://nytimes.com/2002/09/20/international/20sTEXT_FULL.html>

Gordon, Michael R. "NATO Air Attacks on Power Plants Pass a Threshold." *New York Times*, 4 May 1999, p A1.

Gordon, Michael R and Trainer, Bernard E. *The Generals War: The Inside Story of the Conflict in the Gulf.* New York: Little, Brown & Company, 1995.

Glenn, Russell W. *Nuggetizing the Elephant: Managing Urban Complexity during Military Operations (Working Draft).* Published in edited form, as "Urban Fighting is Complex." *Naval Institute Proceedings*, *128*: February 2002.

Gorman, Paul F. "Aachen 1944: Implications for Command Posts of the Future" Command Post for the Future, Institute for Defense Analysis: [paper on line]; available from http://cpof.ida.org/MOUT-Aachen-1944.pdf.

Grau, Lester W. and Kipp, Jacob W. *Urban Combat: Confronting the Specter*, *Military Review*, Leavenworth, KS, July-August 1999.

Gharajedaghi, Jamshid. *Systems Thinking: Managing Chaos and Complexity,* Boston, MA, Butterworth & Heinemann, 1999.

Haines, S. G. *The Complete Guide to Systems Thinking and Learning*. Amherst, MA: HRD Press, 2000.

Hart, Liddell B.H. *Strategy*. New York: Prager Publications, 1975. p.140.

Hoffman, Bruce. *Inside Terrorism.* New York: Columbia University Press, 1998.

Holmes, Richard. *The Oxford Companion to Military History*. New York: Oxford University Press, 2001.

Hosmer, Stephen T. *The Conflict Over Kosovo: Why Milosevic Decided to Settle When He Did.* Santa Monica, CA: RAND Corporation, 2001. MR-1351-AF.

Huntington, Samuuel P. *The Clash of Civilizations.* New York: Touchstone, 1996.

Kaplan, Fred M. *The Wizards of Armageddon*. New York: Simon and Schuster, 1983.

Kelleher, Grace J. ed. *The Challenge to Systems Analysis: Public Policy and Social Change.* New York. John Wiley & Sons, 1970.

Klein, Gary. *Sources of Power: How People Make Decisions.* Cambridge, MA: The MIT Press, 1999.

Klir, G. [Ed.]. *Trends in General Systems Theory*. NY: Wiley-Interscience, 1972.

Lyons, Terrence and Samatar, Ahmed I. *Somalia: State Collapse, Multilateral Intervention, and Strategies for Political Reconstruction*. Washington: The Brookings Institution, 1996.

Lewis, Bernard. *What Went Wrong.* New York: Oxford University Press, 2002.

Mann, Edward C, and Endersby Gary, and Searle, Thomas R., *Effects Thinking: Effects Based Methodology for Joint Operations, Cadre Paper No. 15*, Maxwell Air Force Base: College of Aerospace Doctrine Research and Education Air University, October 2002.

Mintzberg, Henry. *The Rise and Fall of Strategic Planning*. New York: The Free Press, 1994.

Mordica, George J. *It's A Dirty Business, But Somebody Has To Do It*. CALL Newsletter *99-16*, Fort Leavenworth, KS, 1999.

Naveh, Shimon. *In Pursuit of Military Excellence: The evolution of Operational theory*. Portland, Oregon: Frank Cass Publishers, 1997.

Paret, Peter. *Makers of Modern Strategy: From Machiavelli to the Nuclear Age*. Princeton, NJ: Princeton University Press, 1986.

Parker, Geoffrey. *Cambridge Illustrated History Warfare*. Cambridge: Cambridge University Press, 2000.

Perry, William J. "*The New Security Mantra." In How Did This Happen*, edited by James Hodge and Gideon Rose, 224-240. New York: Public Affairs, 2001.

Peters, Ralph. *Fighting For the Future*, Mechanicsburg, PA: Stackpole Books, 1991

Sanger, David E. "Bush To Outline Doctrine Of Striking Foes First." New York Times, 20 September 2002, p. 1. https://ca.dtic.mil/cgi-bin/ebird.cgi

Scales, Robert H. *"The Indirect Approach: How U. S. Military Forces Can Avoid the Pitfalls of Future Urban Warfare," in Future Warfare, Carlisle Barracks, PA: U. S. Army War College, 1999.*

Senge, Peter M. *The Fifth Discipline: The Art & Practice of the Learning Organization.* New York: Doubleday, 1990.

"Soft Bombs Hit Hard." *BBC News Online*, 3 May 1999. Internet: accessed at http://news.bbc.co.uk/1/low/world/europe/334361.stm on 7 September 2002.

Spiller, Roger J. *Sharp Corners: Urban Operations At Century's End*, Fort Leavenworth: U.S. Army Command and General Staff College Press, 2000.

Strange, Joe. *Perspectives on Warfighting: Centers of Gravity & Critical Vulnerabilities: Building on the Clausewitzian Foundation So That We Can All Speak the Same Language*. Quantico: Defense Automated Printing Service Center, 1996.

Sutherland, David W. LTC, Burton, Jay LTC, Granger, Martha MAJ, Reynolds, John MAJ, Tohn, David MAJ, Vanasse, Meg MAJ. *A Systems Approach to Urban Operations Campaign Planning: Dealing with Complexity (Draft Article), 28 Jan 03*

Thomas, Timothy L. *The Battle of Grozny: Deadly Classroom for Urban Combat*, *Military Review July-August, 2001.*

Thomas, Timothy L. *Grozny 2000: Urban Combat Lessons Learned*, *Military Review July-August*, 2000.

Turabian, Kate L. *A Manual for Writers of Term Papers, Theses, and Dissertations*. 6[th]ed. Chicago: University of Chicago Press, 1996.

Thompson, James. *Organizations in Action*. New York: McGraw-Hill, 1967.

Tzu, Sun. *The Art of War*, New York: Oxford University Press, 1971.

United Nations, *World Urbanization Prospects: The 2001Revision*, New York: United Nations Population Division of the Department of Economic and Social Affairs, 2002.

US Army, FM 1-0, *Operational Terms and Symbols (Draft)*. Washington, D.C.: Government Printing Office, 2002.

US Army, FM 3-0*, Operations*. Washington, D.C.: Government Printing Press, 2001.

US Army, FM 3-06, *Urban Operations,* Washington, D.C.: Government Printing Office, 2002.

US Army, FM 3-13*, Information Operations (Draft)*. Washington, D.C.: Government Printing Office, 2001.

US Army, FM 7-15*, Army Universal Task List (Draft)*. Washington, D.C.: Government Printing Office, 2001
.
U.S. Army, FM 90-10, *Military Operations in Urban Terrain*, Washington, D.C.: Government Printing Office, 1979.

US Department of Defense, Joint Publication 1-02, *Department of Defense Dictionary of*

Military and Associated Terms, Washington D. C.: Government Printing Office, 14 August 2002.

US Department of Defense, Joint Publication 5-00, *Doctrine for Joint Planning Operations, 2ⁿᵈ Draft,* Washington D. C.: Government Printing Office, 10 December 2002.

US Department of Defense, Joint Publication 5-00.1. *Joint Doctrine for Campaign Planning*. Washington D.C..: Government Printing Office, 25 January 2002.

US Department of Defense, JP 3-06, *Doctrine for Joint Urban Operations,* Washington, D.C.: Government Printing Office, 2002.

Waldrop, Mitchell M. *Complexity: The Emerging Science at the Edge of order and Chaos*. New York: Simon & Schuster, 1992.

Weigley, Russell. *The American Way of War*. Bloomington: Indiana University Press, 1970.

Zachar, Frank. *Decisive Points in Stability and Support Operations: Current U.S. Doctrine Continues to Support the Tactical Commander.* Fort Leavenworth, KS. School of Advanced Military Studies, U.S. CGSC, 1999.